IMPLEMENT INSPECTOR'S HANDBOOK

PREPARED BY THE EQUIPMENT AND FACILITIES SPECIFICATIONS SUBCOMMITTEE OF THE NATIONAL OFFICIALS COMMITTEE OF USA TRACK AND FIELD

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This manual is part of the USATF National Officials Monograph Series on how to officiate. Each monograph covers the various techniques for each officiating assignment. These monographs are intended for more in depth understanding of each job. They are intended for both the novice and seasoned official. They cover the real details of the job and how it should be preformed. They summarize various techniques to accomplish the job. These monographs can be copied and used for officials training only.

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Dedication:
This manual is dedicated to Dr. James Sabatelle of the Metropolitan Association, Carl Strombom and Norm Morrison of the Pacific Association, and Red Meade of the Southern California Association. Jim and Carl were original members of the committee and Norm was one of the original W&M people along with Red Meade on the West Coast. Red was the original manufacturer of the Trackmaster system. Jim was a contributor to the original version of this manual. All were dedicated to helping improve the proficiency of the Implement Inspector in the United States.

INTRODUCTION

This manual was prepared for Implement Inspectors by the Equipment and Facilities Specifications Subcommittee of the Officials Committee of USA Track and Field for the use, education and training of Inspectors of Implements. As such, it is copyrighted for the use of USATF members. It is predominately slated to the use of the Trackmaster® and similar measuring equipment although the techniques and procedures are general. Additional copies are available by downloading them directly from http://www.usatf.org/groups/officials/resources/weights-and-measures/. Comments and recommendations are welcome and can be sent to Bob Springer, 10063 Arrowsmith Ave. S., Seattle, WA 98178 or via e-mail at bobspringer2@comcast.net. It is the first known publication of how to do the job of an Implement Inspector. In addition to this manual there is available a free newsletter for Implement Inspectors across the country, published by the subcommittee in February and September. To get on the mailing list write to the same address or e-mail your request. The only other one that we are aware of is "Prontuario Di Verifica Attrezzature E Attrezzi" published by the Federazione Italiana Athletica Leggera in 2007 for the WMA World Championships at Riccione, Italy.

This manual is intended as a “how to” book for the novice Inspector of Implements as well as a guide to the seasoned veteran. It is an attempt to get more uniformity in the methods used to certify implements and in the measurement techniques being used throughout the United States.

Although the specifications for implements are published in the various rule books of the various governing bodies for track and field, the method of weighing and measuring implements is not specified in any of them. The Inspector of Implements should be able to say that any implement passes because it met every requirement of the rules governing the meet. Simply weighing an implement does not approve it for use in competition. It must meet all the measurement standards.

HOW TO BECOME A CERTIFIED OFFICIAL

At the present time, USA Track & Field is the major certifier of officials for track and field. As the national governing body for Athletics in the United States, which includes the sports of Track and Field, Race Walking, Cross Country and Long Distance Running, it is affiliated with the IAAF or the International Association of Athletic Federations which governs the sport worldwide. It is likewise the representative for track and field, race walking and the marathon to the United States Olympic Committee.

There are three levels of USATF officials - Association, National and Master. Each has its own qualification requirements. You begin at the Association level after you have attended an officiating clinic and taken the association level test on the USATF rulebook. Each association sets the requirements for their local area. Some associations require officiating at a certain number of meets as a trainee before you can join. Others only require that you complete a test on the rules. Contact your local association to obtain their requirements. You can get their address from the USATF Website at www.USATF.org or by writing the author at the address shown above. At the present time USATF is the only organization which is certifying W&M

officials for USATF, NCAA, IAAF, WMA (World Masters Athletics) and high schools in the U.S.

PREMEET REQUIREMENTS

FACILITIES:
A room at least 10 feet by 10 feet and with a 9 foot ceiling if you are handling javelins and preferably twice that size with a lock and key and limited access is recommended. You will need good lighting, preferably over the measurement area. If you have a room smaller than this you will have problems checking the javelin, and storing implements until competition time. This is particularly true for meets greater than two days. It should be located near the field and preferably near the athlete entry gate. Make sure there are adequate signs and announcements about its location. If you do the measurements on the field or outside, make sure that the wind doesn't interfere with your weight measurements. In a meet where you expect a record you consider an additional location near that event. Then you can quickly recheck an implement during the competition and return it to the athlete before the next throw. You may also want a writing area. To keep athletes and other people away from the measurement area set up the room so that the implements are dropped off at the door. See Appendix Fig. 1

EQUIPMENT:
The most common implement inspection equipment include the Trackmaster(TM), UCS Implement Certification unit and the Gill Implement Certification Kit. However, some meets may find them cost prohibitive as these now retail from about $1200 for a high school unit without scale or javelin gauges to $3700. Currently there are a few specialty tools to measure some implements like the javelin or hammer. This manual will describe several that are available. You also can make some of your own if you have access to shop facilities. The TRACKMASTER(TM) equipment is no longer manufactured. The Gill Implement Certification Kit can be purchased from Gill Athletics, 601 Mercury drive., Champaign, IL 61822 (phone 800-637-3090 or 217-367-8438, fax 217-367-8440, and web page www.gillathletics.com). This kit is available for order online and comes in four versions - high school without javelin gauge for about $1200, high school with javelin gauge for $2300, NCAA kit for $3200, and full kit for IAAF, NCAA, USATF, WMA and high school for $3600. Implement scales for 15 kg and 20 kg can be purchased separately. The UCS kit is available for $3700 and is sold by UCS Spirit, 511 Hoffman Road, Lincolnton, NC 28092, (phone 800-526-4856, fax 704-732-9559 and web site www.ucsspirit.com). Since some of the manufactures change their sources for scales, it is not possible to specify the accuracy or the tolerance for them.

Measuring equipment must be handled with care, maintained, calibrated and properly stored in order to do the best job. The misuse of equipment is usually the biggest problem and is the result of lack of knowledge or training. Misuse leads to damage which results in inaccuracies even when a competent person is using it.

NOTE: All measurement equipment should be checked at least annually against a known standard. The standard should be traceable to a National Institute of Standards and Technology (NIST) standard. This is true for scales, weights and measurement devices, i.e., tapes and calipers. This applies also to the TRACKMASTER(TM), UCS, or Gill templates. When you first get a kit, make sure that all implement measuring devices are measured and marked correctly. The scale should be calibrated, and adjusted if required, immediately after

purchase since its factory calibration will probably not be valid in your geographical area. Each year check that the gauges have not been damaged through use or enlarged. Standards, if you own any, should not be used for routine checks. Any standard must be handled with care and protected so it is not damaged. Equipment templates should be checked periodically with calipers. Never force implements into the templates as you will wear the sides making them less accurate. You will find some of your templates will undersized and some oversized for the measurement they are intended. Take this into account and allow for it if you have a close measurement. Your local scale store, accredited calibration laboratory (like Davis-Inotek or Simco), county Weights and Measures unit, or state Department of Agriculture may be able to do it. Any standard must be handled with care and protected so it is not damaged.

The following is a list of needed equipment for setting up your Weigh-In room:

Recommended Personal Equipment:

Steel Measuring Tapes: 3 m tape for implement measuring. Center point tape for manual javelin profile measurement.

Marking Pens: It is preferable to use paint, particularly on the shot where markings are easily worn off. Mark all implements the same way with the same color, same location and same mark. If it is more than a one day meet, change the color and the mark each day. Make it distinctive. Paint sticks are easier to use and are available in your local hardware store, stationery store or hobby shop. Spray paint can also be used but usually takes longer to dry and is not as easy to use. Fluorescent colors stand out more. Broad Line Deco Color Opaque Waterproof Markers or nail polish also works well. You can also use colored dots or square labels on the javelin or discus. However, these markers wear off easily on the hammer or the shot. Colored electrical tape may be used on the hammer wires and weight handles particularly in wet conditions and can be more durable than paint. Sharpie pens work well in many cases, and are available in several colors; as a minimum, use a black and silver Sharpie, as the latter stands out well on dark implements. Sharpies are also available in retracting/self-sealing pens which can be easily deployed with one hand.

Adhesive Tape: For labeling equipment and laying out javelin measuring tape; also for marking an implement with the reason for its disqualification.

Masking Tape: For erecting signs and schedules.

Implement Labels and Form Sheets: Computer labels can be used to indicate event and name of the implement owner. This helps in tracking implements through the weigh-in process. When used with the implement forms in the Appendix, implements can be monitored easily.

Men Decathlon Shot	Women Open Shot
Name _____	Name _____

Using a form with carbon paper lets the event judge know exactly how many implements were checked in and which implements did not pass. The labels are particularly useful when you have multiple events or flights in the same event such as in Masters and Youth Meets. Samples are found in the Appendix. An alternative is to use the DYMO® electronic tape type device to label each implement. Be forewarned, though, the label adheres poorly to the shot,

particularly if the landing area is rock or gravel.

Stencil: The more distinctive the better. You can buy a plastic geometric or engineering symbol guide at your local stationery store. Alternately you can make your own stencils out of plastic, metal or wood.

Square: Used to test the overall hammer length.

Paperwork: Have a current meet schedule so you know which implements to do first and when to take implements out to the field.

Implement Inspection Signs: Paper signs to indicate location of Weigh-Ins in a plastic cover.

Implement Spec Tables: Complete tables of specifications for all implements from this manual in plastic covers for ready reference. Tables are in the Appendix.

Implement and Impoundment Forms: (see example in Appendix)

Poster/Sign Marking Pens: Some Marks-A-Lots should be available in your kit for emergencies but these aren't the best marking devices unless you're making signs.

Level: Used to level scale location.

Calculator: For use in calculating percentages for javelin measurements.

Caliper: Used to measure the hammer wire diameter, hammer wire loop diameter, hammer handle length and the various points on the javelin. Consider an electronic one, and keep an extra battery in the box. If it has at least 3 ½ inch jaws, it can be used to measure the discus, weight and shot as well as the javelin profile. Manual (Vernier) calipers are less expensive than digital calipers, but learn to read the Vernier scale beforehand.

Handbook: Keep a copy of this handbook in a folder. Note: included in the back are the implement specification tables for all implements in case the individual sheets get misplaced.

Straight Edge: At least 50 centimeters long as a check of the javelin taper or to measure the taper when used with a 0.20 mm feeler gauge.

Javelin Measuring Gauge: You can make your own out of wood or even tape on the edge of the table. See Figures 22 and 23 in the Appendix for examples of ones that were made in three pieces so they could be easily transported. Both are color coded so that the javelin can be easily measured. The one in Figure 22 allows you to do multiple javelins at once for everything but the balance. The dimensions are:

Overall Length:	9 ft / 2.73 m
Overall Width:	6" / 15 cm for all 5
Each Piece:	3 ft / 0.91 m

It uses three 3' pieces of 1"x6" lumber with pieces of shelf hanger as sides so the javelins don't roll off. All marks were engraved into the wood before it was painted for accuracy. The three boards can be held together by hinges or pins to assure constant length.. Alternatively, the

javelin board can be laid out on a paper or cloth template that can be rolled up and taped to a table or the floor. Finally, use a hinge or other sharp edge to place at the balance point. The original one shown in Fig. 23 in the Appendix was only set up for the only three javelins at that time. You also can mount rulers along the board to do the overall and midpoint measurement for the contour or simply use a string or wire to get their approximate location by measuring to the center of gravity from either end and then halving the measurement by folding the string back on itself.

Other Miscellaneous Equipment:

- Wet and Dry Towels for cleaning implements
- Implement Cart, hand truck, wheelbarrow, wagon or grocery cart for transporting implements
- Boxes for segregating unmeasured, approved and impounded implements. You will need a minimum of one per implement type per sex and preferably four for larger meets, i.e., two for check-in and two for measured implements of each type or age group. Masters championship meets may need one per age group or flight. In addition you will need at least one and possibly two boxes for impounded implements of all types. Very robust dairy crates are available from http://www.containerstore.com. Also, steel ammo crates are available from military surplus stores.
- Soft drink plastic trays work well for storing javelins lying down.
- Signs for Location of Implement Inspection Room.

Tool bag for repairing implements:

- coarse and fine files for deburring a discus rim or a shot
- adjustable pliers, needle-nose pliers, Vise-Grips and adjustable wrenches for removing/installing hammer wires, disassembling/reassembling indoor weights and bending/flattening discus hub plates.
- adjustable spanner wrenches of several sizes to remove/replace the plugs on shots and hammers (also will need small hex keys for the set screw – see next item). Some snap ring pliers are robust enough to use for this purpose, such as those from Knipex.
- Several sizes of slotted screw drivers, Phillips drivers (thru #4) and hex wrenches (English & metric) to disassemble a discus and some indoor weights. Fold-up sets offer the best range of sizes for the cost. Two of each set is best, as some discus hubs freeze up over time and require the same size tool on both sides to break the fasteners free of the hub. The #4 Phillips is a common size for discus fasteners, but is not typically found in fold-up tool sets – a good alternative is a 3/8" drive #4 Phillips bit with a 3/8" drive stubby handle.
- chain grip for holding shot or hammer while removing plug (Vise Grip model 20R works well)
- dead-blow hammer or rubber mallet for tapping stubborn discus plates together
- small pick or awl set for cleaning out the fasteners on discuses, hammers and shots, prior to implement disassembly or plug removal.
- Polanik swivel wrench for removing Polanik hammer and weight swivels
- penetrating oil or liquid wrench to help loosen stubborn bolts
- lead pellets and scoop for adding weight to shots
- Loctite or similar plumber compound for indoor weight swivel pins
- Superglue for javelin grip cord
- box knife for removing tape from hammer wires and handles

- 3/8" and larger washers for adding weight to an indoor throwing weight

Notebook: To do any needed calculations and to record calibration procedure. Also record the following information on any implement that is impounded: Owner/Athlete, School, type, brand, failing parameter, condition of implement, i.e., Is failure due to wear or damage or is it a new implement? See Appendix for a sample Inspector of Implements form.

Rulebooks: Always have a current rulebook for the type and level of meet you are officiating. The specifications are slightly different in some cases, particularly in the high school rulebook. However, now all rulebooks refer to and use IAAF specifications. They can be purchased from the following institutions:

(1) National Federation of State High School Associations
P.O. Box 360
Indianapolis, IN 46206
800-776-3462
www.nfhs.org (general site) and www.nfhs.com (on-line store)
Published in 3 volumes at $7.20 each for Rules, Officials and Case Book, plus shipping charges. The Rule book and Case book are annual and the Officials book is published every two years. Order via the on-line store, phone or mail.

(2) National Collegiate Athletic Association
P.O. Box 6222
Indianapolis, Indiana 46206-6222
317-917-6222
www.ncaa.org and www.ncaa.com
Cost is $7.80 plus shipping charges. Order at www.ncaapublications.com (go to the **Publications**, **Playing Rules** page). The rule book is published once every two years and is also available as a PDF download on the same web page.
Rules interpretations and case book are downloadable at www.ncaa.org.

(3) USA Track and Field
132 E. Washington Street, #800
Indianapolis, IN 46204
317-261-0500
www.usatf.org and http://www.usatf.org/groups/Officials
Cost is $15.00 ($13.50 for USATF members) annually plus shipping charges. You can order by phone or find the on-line ordering links at: http://www.usatf.org/groups/officials/resources/rules. A PDF download is also available on this page.

(4) International Association of Athletics Federations
17, rue Princesse Florestine
BP 359
MC 98007 Monaco
377-93-10-8888
www.iaaf.org
Cost is $10 from IAAF and is published every two years. You can order from the web site;

cost includes mailing. Also available for download at the same web site.

(5) World Masters Athletics
http://www.world-masters-athletics.org.
The rules are available as downloads only at this web site. This includes separate PDF files for the rules of competition and the technical appendices.

Equipment provided by the Meet Site:

W&M room: See recommendations in Figures 1 & 2, in the Appendix.

Table: Three to four tables which are at least 6 feet in length. One would be used for your scale and measuring instruments, one for the hammer and/or javelin measurements and one for implement check in. Make sure you have plenty of room particularly if you are doing the javelin. A solid table is preferable to a folding table. A couple of chairs are always useful.

Scales and scale comparison summary: The following precautions should be observed:

1. When properly set up, the scale must be level. Some scales include an integral bubble level. For those that don't, a small torpedo level, or similar, should be used to set the scale level.
2. Most tables will bend as weight is placed on them. To ensure the scale does not get tilted by the table when an implement is being weighed, the scale should be placed either in the middle of the table, or directly over one of the legs.
3. Most electronic scales require 10-15 minutes time to warm up. Sensitive scales may require 20-30 minutes of warm up time.
4. When placing an implement on an electronic scale, place it in the center of the pan. Most scales will display measurement error if the load is off-center.
5. Lower the implement on the scale; don't drop it.
6. A scale should be calibrated by an accredited organization once a year, or more often if experience indicates the scale will drift during that period. A scale should be calibrated prior to any "big deal" meet. A scale should be calibrated whenever it has been accidentally dropped, or an implement has been dropped on the scale.
7. When using a double pan balance, place the weights on the left and implements on the right. Test this by moving the ounce slide to the 1 ounce position and see which way the balance moves, i.e. it takes one ounce of weight on the side containing the implements to rebalance the scale to zero. Note some scales have a plus and minus designation to indicate overweight and underweight respectively.

The ideal tolerance of the weighing scale is one part in 10,000 (100 mg or 0.1 g per one kilogram) or better. This meets the National Institute of Standards and Technology Class Field Standards for weights (NIST Class F). See tables below for the full spectrum of weights of interest for field events implements. (Note: Throughout this manual, the terms "tolerance" and "accuracy" are used interchangeably although scientifically these terms have slightly different meanings. Also, most scales' actual accuracy is not equal to their minimum resolution.) However, a tolerance of one part in 10,000 is quite expensive, usually costing in excess of $1000 for such an electronic scale.

If a scale of NIST Class F tolerance is too expensive, a double-pan balance or electronic scale capable of measuring to at least one part in 3,000 is preferred. One in 3,000 means the scale's tolerance is 1/3000 of the range of the scale. For example, a 1:3,000 scale, which has a 15 kg weighing range, would have a claimed accuracy of 5 grams.

But the use of any scale is better than the use of none. For example, the older TRACKMASTER(TM) units have a tolerance of approximately one part in 2,000, which was the previous standard. The following tables may be of use as you look for a scale. There is no intent to endorse any of the scales shown, only to show the relative cost in 2011 for the various tolerances. Note the wider the range desired, the lower the relative tolerance. Pay attention to both the capacity and increment data: they are available in different combinations. The best combination is a large range with a small increment, which costs the most.

Any newly-purchased scale, particularly a sensitive one, should be calibrated (and adjusted, if required) in the general geographic area of where it will be used. Do not rely on the factory adjustment – latitude, altitude and even the makeup of the earth in your location affect the apparent local gravity. For example, a newly-purchased scale, with claimed accuracy of 2 g, can easily indicate 10-20 g, or more, too high at full range. This is a result of its factory adjustment in a different part of the world. However, after adjustment in your locale, it should produce results close to its factory specifications.

Columns 1 and 2 of the following table contain the manufacturer's name and model number for an assortment of commercially-available scales. The next column is the maximum capacity of the scale. The fourth column indicates the smallest measurement increment that can be read. The comments column contains any special considerations listed by the manufacturer in the literature. The cost column provides typical prices as found on the internet in 2011. The last column shows the theoretical tolerance in terms of the range of the scale, that is, one part per thousands. Ideally, a scale listed as 1:10,000 will have one gram of error in 10 kg of total weight (see the Notes after the table). The last three rows provide the ideal, suggested and minimum tolerances for comparison.

SCALE COMPARISON SUMMARY

Manufacturer	Model	Capacity	Increment	Comments	Cost	"tolerance"
Sartorius	CPA34000	34 kg	1 g	NTEP Class III, internal cal	2650	1:34,000
Ohaus	RD6RS	6 kg	0.2 g	NTEP Class III	$696	1:30,000
Ohaus	RD30LS	30 kg	1 g	NTEP Class III	$915	1:30,000
Ohaus	EB6	6 kg	0.2 g		$356	1:30,000
Ohaus	EB15	15 kg	0.5 g		$356	1:30,000
Ohaus	EB30	30 kg	1 g		$356	1:30,000
Ohaus	RD12LS	12 kg	0.5 g	NTEP Class III	$803	1:24,000
Nagata (c/o Gill Athletics)	FAT-06	20 kg	1 g		$863	1:20,000
Sartorius	MW1P1U-30ED-L	30 kg	2 g	NTEP Class III	$832	1:15,000
AND	EK-12ki	12 kg	1 g		$400	1:12,000
Ishida	QB-12KE	12 kg	1 g		$999	1:12,000
Acculab	SVI-10A	10 kg	1 g		$210	1:10,000
Acculab	SVI-20B	20 kg	2 g		$210	1:10,000
new Trackmaster		20 kg	2 g			1:10,000
Doran	7025XL	25 lb	2 g	NTEP Class III	$972	1:5,000
Doran	7050XL/12	50 lb	5 g	NTEP Class III	$1062	1:4,500
Pennsylvania	7000	20 lb.	2 g		$495	1:4,500
Pennsylvania	7000	50 lb.	5 g		$495	1:4,500
Jadever (c/o Gill Athletics)	NWTC-15K	15 kg	5 g		$504	1:3,000
Yamato Accuweigh	PPC-200W-20	20 lb	5 g		$370	1:2,500
old Trackmaster		16 lb	~4 g			~1:2,000
Yamato Accuweigh	PPC-200	50 lb	20 g		$370	1:1,000
bathroom		300 lb	1 lb			1/300
IDEAL						$\geq$1:10,000
Suggested						1:3,000
Minimum						1:1,000

Note 1: The cost and tolerances of the scales roughly track each other. This is another case of "you get what you pay for."
Note 2: Some of the more expensive scales have optional battery packs available. Some of the less expensive scales have integral battery compartments.
Note 3: The numbers in the "increment" column need to be interpreted carefully. "Increment" means the smallest granularity which the scale will display. This is **not** always the same as accuracy. An NTEP scale's accuracy should approach its minimum increment. A non-NTEP scale's actual accuracy may be two or three times its minimum increment. Therefore, the "tolerance" column is a guide only.

For inspectors wishing to check their own scales, the following table is provided with mass standards that span the range of the throwing implements. Ideally, the heaviest standard should approximately equal the maximum capacity of the scale, and other standards, if used, should be selected evenly among the implements weights of interest. Mass standards are

available from Rice Lake Weighing Systems, Henry Troemner LLC and Mettler-Toledo, among others.

Class F Tolerances for Field Standard Weights
NIST Handbook 105-1

Standard (lb)	Standard (kg)	grams	NIST Class F Tolerance (g)	Implement weights in this range
66.1	**30**	30,000	3.0	56 lb
50	22.7	22,680	2.3	56 lb
44.1	**20**	20,000	2.0	20 kg, 35 lb
30	13.6	13,608	1.4	35 lb
25	11.3	11,340	1.1	25 lb
22.0	**10**	10,000	1.0	25 lb, 20 lb
20	9.07	9,072	0.91	20 lb, 16 lb
11.0	**5**	5,000	0.50	6 kg, 5 kg, 4 kg, 12 lb
10	4.54	4,536	0.45	12 lb, 5 kg, 4 kg, 8 lb
6.6	**3**	3,000	0.300	3 kg, 6 lb
5	2.27	2,268	0.227	6 lb, 2 kg
4.4	**2**	2,000	0.200	2 kg, 1.6 kg, 1.5 kg
3	1.36	1,361	0.136	1.6 kg, 1.5 kg
2.2	**1**	1,000	0.100	1 kg
2	0.907	907	0.091	800 g, 700g, 600 g
1	0.454	454	0.070	600 g, 500 g, 400 g

The following table is intended as a starting point for selecting a scale. Select the maximum weight implement to be weighed and find the ideal and suggested tolerances. These can be compared against the Scale Comparison table to get an idea of what scales may be of interest.

Scale Tolerances for Implements
Based on full use of Class F Standards

Implement Weight			Tolerance		Implement Name
lb	kg	g	Ideal (1:10,000) (g)	Suggested (1:3,000) (g)	
56	25.40	25401	2.54	8.47	56 lb Weight
	20	20000	2.00	6.67	20 kg Weight
35	15.88	15876	1.59	5.29	35 lb Weight
25	11.34	11340	1.13	3.78	25 lb Weight
20	9.07	9072	0.91	3.02	20 lb Weight
16	7.26	7260	0.73	2.42	16 lb Shot/Hammer/Weight
	6	6000	0.60	2.00	6 kg Shot/Hammer
12	5.44	5443	0.54	1.81	12 lb Shot/Hammer/Weight

One final consideration regarding the selection of a scale: One must consider how much accuracy is enough. How much accuracy is not enough? How much is too accurate (i.e., too expensive)? Consider the following two cases:

Scale #1 has an actual accuracy of 10 grams (±10 g). This means, depending on its adjustment, it could show a true 4.000 kg mass standard to weigh anywhere between 3.990 kg and 4.010 kg (that is, anywhere between 10 grams low to 10 grams high). Since the ±10 g performance is within the manufacturer's stated tolerance, the scale will be deemed to be working properly. In the real world, this means the scale *could* indicate an illegal 3.990 kg shot to weigh 4 kg, if its adjustment happened to be high in its tolerance band. Or it *could* indicate a legal 4.009 kg shot to weigh 3.999 kg, if its adjustment happened to be low in its tolerance band.

Scale #2 has an actual accuracy of ±1 gram. This means it could show a true 4.000 kg mass standard to weigh between 3.999 kg and 4.001 kg. This means the scale *could* indicate an illegal 3.999 kg shot to weigh 4 kg, if its adjustment happened to be high in its tolerance band. Or it *could* indicate a legal 4.000 kg shot to weigh 3.999 kg, if its adjustment happened to be low in its tolerance band.

Clearly, Scale #2 will cause fewer illegal implements to be passed, and fewer legal implements to be disqualified. It is up to the individual, association, school or club to decide how tight the scale's tolerance should be, vs. how much they want to pay for the scale.

Weights: If a balance scale is being used, various combinations of weights will be required, depending on the competition. This can be accomplished with the following sets of weights: (a) 1, 2, 5, 10, 20 lb; (b) 1, two 2, 5 kg; and (c) 50, 100, 300, 400, 600, 800 g. This allows the weighing of all implements up to the 35 lb weight. The following list shows the types of meets and the expected implements:

	Men's Open	**Women's Open**
Shot and Hammer:	7.26 kg	4 kg
Javelin:	800 g	600 g
Discus:	2 kg	1 kg
Weight	56 lb, 35 lb	20 lb

	Junior Men	**Junior Women**
Shot and Hammer:	6 kg	4 kg
Javelin:	800 g	600 g
Discus:	1.75 kg	1 kg

	Collegiate Men	**Collegiate Women**
Shot and Hammer:	7.26 kg	4 kg
Javelin:	800 kg	600 g
Discus:	2 kg	1 kg
Weight:	35 lb	20 lb.

	Men's Masters	**Women's Masters**
Hammer:	3 kg, 4 kg, 5 kg, 6 kg, 7.26 kg	2 kg, 3 kg, 4 kg
Shot:	3 kg, 4 kg, 5 kg, 6 kg, 7.26 kg	2 kg, 3 kg, 4 kg
Javelin:	400 g, 500 g, 600 g, 700 g, 800 g	400 g, 500 g, 600 g

Discus:	1 kg, 1.5 kg, 2 kg	0.75 kg, 1 kg
Weight:	12 lb, 16 lb, 20 lb, 25 lb, 35 lb	4 kg, 12 lb, 16 lb, 20 lb
Superweight:	25 lb, 35 lb, 20 kg, 56 lb	16 lb, 20 lb, 25 lb, 35 lb

	High School Boys	**High School Girls**
Shot:	12 lb	4 kg
Javelin:	800 g	600 g
Discus:	1.6 kg	1 kg

	Jr. High School Boys	**Jr. High School Girls**
Shot:	8 lb, 4 kg	6 lb

	Youth Boys	**Youth Girls**
Shot:	2 kg, 6 lb, 4 kg, 12 lb	2 kg, 6 lb, 4 kg
Javelin:	300 g, 600 g, 800 g	300 g, 600 g
Discus:	1 kg, 1.6 kg	1 kg

	IAAF Boys	**IAAF Girls**
Shot and Hammer:	5 kg	4 kg
Javelin:	700 g	600 g
Discus:	1.5 kg	1 kg

Athletics for the Disabled:

	Javelin	**Discus**	**Shot**
Cerebral Palsy	600 g, 800 g	1 kg, 1.5 kg	4 lb, 6 lb, 3 kg, 4 kg, 5 kg
Wheelchair	600 g, 800 g	1 kg, 1.5 kg 4 lb, 6 lb, 8 lb	2 kg, 3 kg, 4 kg, 5 kg
Blind	400 g, 600 g, 800 g	1 kg, 1.5 kg, 2.0 kg	3 kg, 4 kg, 5 kg, 7.26 kg
Ambulatory	600 g, 800 g	1 kg, 1.5 kg	4 kg, 5 kg, 6.25 kg
Special Olympics		3 lb, 4 lb, 6 lb, 4 kg	
Hearing Impaired	800 g	2.0 kg	7.26 kg

Weights should be handled with care so as not to damage them so they either gain weight, less likely or lose weight by being dropped.

Note: There are 16 oz per lb, 453.5924 g per lb, 28.349527 g per oz, and 2.20462 lb per kg. Only the 6, 8 and 12 lb shots, because they are youth, junior high and high school implements, respectively, are still weighed in pounds. The other weights have been accepted internationally and have taken on the metric weight equivalent shown***. NOTE: For NCAA meets accept weight implements weighing 20 lb and 35 lb via discussions with Bob Podkaminer and NCAA Rules Committee in February, 2006. Note the same is true for high school implements that are specified in pounds.***

DAY OF THE MEET

1. Arrive early at the site to make sure equipment being supplied by meet management is present and in good working order. Normally this should be at least two hours before the first throwing event. If possible, do it before the day of the meet.

2. Inform the appropriate Event Heads and the Field Referee the type, color and location of the mark to be used on the implements that particular day. If the possibility of breaking a national or world record exists, let the judge and the referee know your location. Try to have a location near the venue where an implement could be rechecked during the competition in such a case.

3. While returning to the Implement Inspection room, you should make sure that there are adequate signs to direct athletes to your location from where they will normally enter the track. Post the times for weigh-ins. Make sure you have a copy of the event schedule and post it nearby to avoid having to answer questions regarding starting times.

4. Set up the Weigh-In room. Set aside an area for receiving and marking implements with the athlete's name or school. This should be near the door to keep athletes away from the measurement area. In addition, set aside separate areas for storing competition-ready implements, impounded implements and unchecked implements. It is important that each of these areas is segregated to avoid problems. See drawing in the appendix.

5. Set up your measuring equipment. Pay particular attention to having your scale level. Place the scale on the table carefully, so that flexing of the table under load won't tilt the scale. Put the scale in an area with plenty of space to avoid moving it to weigh all the different size implements. The scale should not be in direct sunlight, as heating it may alter its adjustment. The scale should be turned on about 15 minutes before any calibration check to allow for adequate warm-up time. Cross check your scale versus a second scale or standard. Two calibration weights may be needed, one at the low end and one at the high end, i.e. 400 g or 600 g and 8 kg respectively. Layout your javelin measuring tape. Try to have separate areas for each implement and its measurement. If there is more than one person working, make sure there is enough room to move around, particularly with the javelin. It becomes more difficult if the ceiling is not at least 9 feet to allow the javelin to be turned vertically.

6. Set up an implement check-in sheet. Have room to record the name of the individual, school and manufacturer for all implements measured and/or impounded. The Equipment and Facilities Specification Sub-committee (E&FSS) would like information on impounded new implements in order to work with the manufacturers on improving equipment and gathering statistics on common explanations for implement impoundment. This information will help us suggest to the manufacturers improved specifications for the various implements as well as suggesting changes in the order of doing the measurements.. Send the information to the chair, Bob Springer, 10063 Arrowsmith Ave. S., Seattle, WA 98178 or via e-mail at bobspringer2@comcast.net.

7. Prepare to make the first measurement at least an hour to an hour and a half before the first throwing event. If the inspector is to bring the implements to the competition venue, then

take them out 10 minutes prior to the start of the warm-up period for the scheduled event. Typically this is so they arrive about 30 to 35 minutes before the event starts. Make sure to turn them over to an event official and not just leave them on the field.

CHECKING OF EQUIPMENT

The following sections are ordered in such a manner so the most common implement defects are listed first in order to minimize time spent on equipment that eventually will not pass. The order was generated from a consensus of the most experienced implement inspectors in the country. The order may be varied at the implement inspector's discretion, but be consistent and don't leave out a measurement.

RECOMMENDED ACCURACY IN MEASUREMENTS:

1. As discussed in the scales section on equipment, NIST recommends an accuracy of 0.01% or 1 part in 10,000. This is equivalent to 0.1 g per kg for weight or 10 mm (1 cm) per 100 meters for length measurements. However, because of cost and the continued use of older scales, the E&FSS committee recommends a weight tolerance minimum of 0.03%.

2. Based on the accuracy for measuring record lengths by steel tape and the impact of temperature, plus the recommended procedures for certifying electronic measurements, the accuracy varies from 0.04% to 0.17% for sector lines in the long throws. The E&FSS Committee recommends a minimum standard of 0.1% or 0.1 mm for every 100 mm in diameter for a shot. This means gauges used for implement measurement should be accurate to 1 part in 1000. If properly manufactured, the gauges would be accurate to ± 0.005 inch (0.127 mm) or 7 parts in 10000 versus our recommendation of 10 parts in 10000. However, the proper care and handling is mandatory in order to maintain its accuracy. Remember any standard has some error in it. Note a temperature change of 36 ℉ (20 ℃) with some linear measuring devices can alter the reading by as much as 0.24 mm per m. This may be additive to the tolerance limit. Thus if you have an implement just missing the spec and there is a large temperature difference between the measuring device and the implement or the measuring device and the temperature at which the device was calibrated, pass the implement. This illustrates why it is good practice not to have the implement or the measuring equipment in the sun.

Basis for Accuracy Measurements

Type of Measurement	Expected Accuracy	Measurement	%	Parts/ 1000
Pole Vault Electronic	± 2 mm	5 m	0.04	0.4
High Jump Electronic	± 2 mm	2 m	0.01	1
Discus/Hammer Sector	±164 mm	100 m	0.164	1.64
Javelin Sector	± 169 mm	100 m	0.169	1.69
Temperature Correction at 10 ℃ difference	± 12 mm	100 m	0.012	12
Weight , NIST Class F	± 0.07 g	700 g	0.01	0.1

GENERAL PROCEDURE FOR ALL IMPLEMENTS:

1. Have an implement check-in sheet for each athlete to signs and indicate the number and type of implement(s) he or she is leaving. Have tape or labels and pens available so the athletes can put their name and their school name, if appropriate, on the implement.

2. Have a separate box or container for the implements to be inspected to avoid mixing with previously certified implements.

3. Check each implement for internal movement (including the javelin should this be a requirement) or loose connections when you first pick it up.

4. Check the general appearance. Is this a homemade implement or a modified implement? Are all the original pieces there? Does it have the expected shape? There should be no significant nicks, gouges, and logos, decals or movable implement weights or parts that would give an advantage for a better grip or better aerodynamics.

5. Does the implement have previous weigh-in markings?

6. Does the implement have a name or school identification, in case you have to impound it, so it can be identified for picked up later?

7. Is the implement clean or dirty or with excess tape or other removable debris which might affect its weight or center of gravity? Note a single piece of tape or label will not make enough difference in weight or balance such that it needs to be removed. Your equipment is not accurate enough to detect that small an increment.

8. Weighing is first because it is the most common reason for implement failure. Constant use and damage tend to reduce the weight of an otherwise legal implement. When checking the weight of the implement, do it carefully. There are three common types of scales used. Any scale which can or has been certified by your local or state authority or an accredited calibration lab is acceptable. The three types of scales are electronic, balance and lever or beam. Be aware that there have been two different types of the beam scales used in the Trackmaster™ kits over the years. The older versions of the TRACKMASTER(TM) made by Red Meade or Jack Balko used a beam scale. Red Meade manufactured units with serial numbers below 180. Make sure to know the steps in calibrating the scale. Normally put the calibration weights on and then set the balance point. To pass, an implement must be at or above the balance point. The new version by Daktronics uses an electronic scale. Because even these scales can't be exact, err on being fair to the athlete. If an implement fails on one scale but passes on another, let it go unless there is a significant difference in calibration or tolerance between the two scales. If it is that close to weight, it really will not have any impact on the competition or a record. (See previous section on scales for discussion of accuracy and tolerance.)

NOTE: When using any scale, treat it carefully. When removing implements or weights from the scale, do it gently to avoid damaging the knife edges or bearings. This is particularly true for a single pan balance such as that used in the TRACKMASTER(TM). Hold the bar when

removing weights or implements so the bar doesn't damage the knife edges or bearings. With care, the scale will last a long time. Without care, damage can occur very quickly. Remember, with normal use, scales and weights need to be calibrated at least annually. When moving the scales, immobilize the scale to protect the knife edges or bearings. Use foam rubber under the arm and/or on top of it for protection. Calibrate the scale before use each day or each time you move it. For the double pan variety, try weighing two identical weights switching them to make sure the weights are balanced and level enough. Keep the scale out of the wind and sun because both can impact even an electronic scale.

Before putting any weight on the scale, test the movement of the pan(s) to make sure it moves easily and isn't bound by anything. When putting an implement on the pan make sure it is well balanced. For hammers, shots and weights, use a washer on each pan (so balanced) to prevent the implement from rolling. Make sure the scale balances before weighting the implements since the two holding devices may vary in weight. On an electronic scale with one pan you can tare the weight out. For the hammer put the ball in the handle loop. Be careful with new wires that may spring out. Make sure the wire isn't in contact with any other surface while weighing the hammer. For the javelin, the center of gravity is near the front of the handle so place the javelin with the front of the handle near the center of the pan. In general place the weights and the implements as near to the center of the pan as possible (see also discussion of tolerance/accuracy under the equipment section on scales).

9. Continue on with the other implement specific tests.

10. If the implement passes all the tests, then mark it. Label it in a place where the marking is less likely to come off - like at the weight mark, the hex screw, near the swivel or just in front of the grip. Some inspectors mark javelins on the tip, but I find it can come off more easily there. Do not put the mark behind the grip where the javelin thrower may grip the javelin. Some use symbols, some use lines, some use initials and even dates. Make sure the mark is dry and then place it with the other approved implements for the day. This is the recommended procedure. Short on help? Then return it to the athlete to transport to the competition site.

11. If you are impounding an implement, let the athlete know the reason and the time to pick up the implement after the event. Record the reasons for impounding any implement in your notebook, on the check-in sheet and place a piece of tape or label on the implement. This will save time if there is a protest or the coach or referee becomes involved. This way the implement in question can be located quickly and the reason for disqualification easily given.

12. If possible, take the implements out to the competition area either 35 minutes before the scheduled start or ten minutes before warm-ups or have an event official pick them up. If possible, always turn over the marked implements to an event official insuring the chain of custody and making sure no implements are lost.

The following sections detail how to certify each of the implements. Because there are subtle differences between the wordings in each rulebook, it is always a good idea to review the rulebook the night before the meet. This is particularly true for a meet with a different set of rules than have been used recently. Use the rulebook as the ultimate authority, unless there has been in intervening change. The E&FSS committee keeps implement inspectors apprised

of changes throughout the year. Send an e-mail to bobspringer2@comcast.net so notification can be done in a timely fashion. These sections try to point out the similarities and the differences between the various rulebooks.

When demonstrating to athletes or coaches how much their implement is light, use the following table for coins as an indication. Thanks to Shirley Crowe and Emmitt Griggs:

Coin	weight (kg)	weight (g)
Dime	0.0020	2
Penny	0.0025	2.5
Nickel	0.0050	5
Quarter	0.0055	5.5

SHOT:

1. Note: internal movement by sound or feel is no longer a reason to impound a shot. Make sure that the weight stamp or the plug cannot be used as a finger hold. Some screw the plug in beyond being even with the surface. This was an emphasis point in the 1998 HS rules. If the shot has a removable plug for weight adjustment, either 1) seal it with bath tub sealer or Elmer's glue if it appears loose to prevent tampering or 2) make a mark across one side of the plug to indicate the location of the plug when it was checked. Elmer's glue can be bought in colors so it can't be easily replaced, but the use of glue has the disadvantage that it takes longer to dry. Unless someone has recently opened it, most plugs are hard to remove. A mark across the plug is often adequate.

2. The shot should be smooth. In fact, the IAAF and USATF require a maximum roughness of N7. Check for finger holds, cracks or dents. Look for out of roundness by sight or feel. It should be essentially spherical with no significant flat spots that might help gripping. Assume it is spherical if the shot passes the diameter in step 4 using a minimum of three out of four planes including the plane containing the flat spot. If there is a significant flat spot (i.e., a several millimeter gap between the ball and gauge), then impound it. Some practice shots and overweight shots turn up at meets. These shots are usually cast iron and have such a large imprint of the weight. These are legal. If using this implement gives a thrower an advantage or compromises the safety of the event, then impound the implement. The shot may be rolled to check if the center of gravity is significantly from the center. However, there is no specification for this eccentricity, and thus should not be used to disqualify an implement.

3. Weigh the shot. Make sure the shot is clean of any foreign substance that might significantly affect the weight. If just at weight, recheck it to make sure it is clean, and that removal of any debris doesn't cause it to drop below the minimum. Normally the tolerance of your scale won't be sufficient to measure such small differences. Note if you are using a double pan scale place an equal size washer on each pan to keep the shot from rolling off the pan, and place the weight on one pan and the shot on the washer on the other one. The men's shot weighs 7.260 kg and the women's 4.000 kg. For other weights see the previous chart or the tables in the Appendix. In areas where junior high or middle school boys throw the 8 lb shot, be alert for 8 lb shots masquerading as high school girls 4 kg shots – this is a common problem. Also be aware the Masters W75+ and Sub-Bantam shot is 2 kg, not 4 lb. If you are using the older TRACKMASTER(TM) use weights #1, 4 and 8 for the men's shot,

weight 7 for women's shot, weights 5 and 6 for the Junior men's and weight 6 for the Junior women's shot. Remember that there is a tolerance for any scale but particularly the electronic scale. Because there is a digital display, people tend to believe all of the numbers. If the reading is within the tolerance limit, then one cannot tell if the value is less or more than the displayed weight (for further details, see the section on scales under equipment).

4. Check the minimum and maximum diameter using three locations with the appropriate diameter gauge. For the men's shot the respective diameters are 110 mm and 130 mm while for the women's shot, 95 mm and 110 mm. For other dimensions see the tables in the Appendix. If all three diameters clear, pass the implement. If one or more fail, check at least two more locations. If you can't get at least three acceptable measurements, impound the implement. For indoor competitions, each rulebook is slightly different. The acceptable maximum diameters are slightly larger for synthetically covered implements in USATF and IAAF meets, 145 and 130 mm respectively. As dictated by the facilities and the Games committee, outdoor metal shots, synthetic shots with rubber or plastic covers or metal-filled ones may be used provided these implements meet weight. For Masters implements the USATF generalized the diameter rule. The diameter for a synthetic covered indoor shot can be a maximum of 15 mm larger than the corresponding outdoor men's shot and 20 mm larger for the corresponding outdoor women's shot. In 2001 USATF and IAAF specified that only indoor or outdoor implements can be used in the same competition, not both.

NOTE: 1) Some new stainless steel shots have not been making the minimum diameter.

5. If it meets all of the requirements, mark it and put it with the other approved implements for that event. If not then see Step 11 above in the general procedures section.

See Table 4 and Figure 9 in Appendix.

DISCUS:

1. Check the rim and nearby surfaces for dents, cracks, or roughness that would aid the grip. All discuses must have metal rims with the exception of high school where the use of the rubber discus is allowed. Check the implement for any loose parts. If there are any significant areas that can be gripped easily, impound it. Normal wear or minimum damage is acceptable. Some athletes have immersed discuses with wooden centers in water in order to make weight. On a hot, sunny day a wet implement dries quickly and is underweight during the competition. Impound any wet discus. Be sure the profiles of both sides are the same. Place a straight edge on each side. The discus contour should be in contact along the entire length of the straight edge for a legal implement. That is, the taper should not be concave or convex in nature . Dents are acceptable as long as they aren't along the edge, too big or cause the edge not to fit the ring. A bent rim is usually the cause of the last problem. A discus is held at the edge so indentions closer to the center should not give a thrower an advantage. A broken or cracked metal ring is reason enough to impound a discus. Safety should be a major concern. However, because the discus is held at the rim, allow small dents and cracks on the side of the discus because these flaws don't aid in holding the discus, unless its structural integrity is compromised.

NOTE: 1) In 1993 USATF and IAAF rule changes limited the degree of roughness allowable on the edge of the discus. Manufactured grooves in the metal rim or elsewhere are not allowed. The NCAA and NFHS also require a smooth rim.

2) The PACER Gold Plus was declared illegal for USATF and IAAF competition because it was weighted more on side than the other. Although the NCAA did not declare it illegal, their rules read the same as the USATF and IAAF on discus conformity which in my opinion makes it illegal. The high school rule is less clear and therefore is probably legal since there is no mention that both sides be symmetrical. This discus was weighted on one side more than the other as part of the manufacturing process.

2. Weigh the discus. The Men's discus is 2 kg while the women's is 1 kg. The high school boy's discus is 1.6 kg. Masters women have added a 750 g discus (However, be aware of this nuance: There are commercially-available 750 g discuses which have the same physical dimensions as the 1 kg discus – these are NOT legal per WMA or USATF – the legal 750 g discus has unique diameter and thickness specs). See Appendix for other weights. With the older version TRACKMASTER(TM) use the following weights: Men's 1 and 4, Women's 2 and Junior Men's 3. The Junior Men's discus is 1.75 kg. The Masters have a 1.5 kg discus.

3. Gauge the diameter (219-221 mm for men and 180-182 mm for women; see Rule 189 or the appendix for others), center diameter (50-57 mm), and center (44-46 mm for men and 37-39 mm for women) and the minimum edge (12 mm) thickness. Check at least three points for each dimension to insure adequate roundness and thickness. Note the minimum thickness of the edge should be measured at a point 6 mm from the edge. The center plate of the discus, if there is one, should be flush with the mating surface. For dimensions of other discuses see the Appendix. Note that the flat surfaces must meet only the dimension requirement and do not necessarily have to made of metal. Indeed, some discuses have metal plates smaller than the whole flat surface (Early Denfi discuses ~ 1995). Both are OK. In measuring the edge thickness of the discus, place the measuring tool perpendicular to the sides. The first edge thickness measuring devices included in the 1997 and early 1998 Trackmaster™ kits from Daktronics were themselves too thin. If not held properly, these early gauges will indicate a valid thickness when in actuality the discus edge thickness is too thin. This gauge should itself be a minimum 1/4" thick to limit this problem. Below this minimum, it is difficult to place the gauge perpendicular to the sides. This gauge must be very accurate to measure the edge thickness. The discus should be at least 6 mm thick at 12 mm from the periphery. The easiest and most accurate way to measure this parameter is using a gauge. The edge of a discus is a semicircle with a 12 mm minimum and a 13 mm maximum in diameter. Thus one gauge should be a 12 mm diameter semicircle and the other 13 mm. If the discus edge fits the 12 mm gauge without rattling, the implement meets the minimum thickness. If the semicircle doesn't fit into the 13mm gauge then the discus is too thick. This is particularly true for the Denfi discuses.

4. Check the taper of the sides by laying a straight edge from the center plates to the rim on both sides. It should be in contact along the contour to the metal edge.

5. If the implement passes, mark it and place it with the other approved implements. Mark the top of the discus rather than the bottom. The two sides can be distinguished from one another - the label is placed on top while the scratches are found on the bottom. If the discus does not pass, note the reason for failure as listed in Section 11 of the general procedure section.

6. If the discus rattles, then the plate is loose or something is in the void space. If the surfaces are tight against the rim or the discus is too thick, disassemble the discus with an Allen

wrench, screw or Phillips screwdriver and cleanout the edges. If it is a wood discus place some tissue in the center to keep the clay ring or ball from rattling potentially correcting the problem. Often the plates get tightened too much so that the edges of the flat surface have been bent upward so that the discus is too thick. Remove the flat plates and level them with a hammer or bend them using pliers or Vise-Grips. The plates usually straighten out and fit back in the groove. Other times the plates are not distorted, but the plate fasteners simply need to be snugged to get the discus within the thickness limits. When you dismantle a discus, make sure you know which side which plate go together. This is particularly true for discuses that may be out of round or the rims are bent and thus may only fit back together one way. Mark the plates, the sides and the rim before taking the implement apart. See Table 5 and Figures 10-13 in Appendix.

HAMMER:

1. Check the hammer head for internal movement, dents, cracks and a plug for adjusting the weight. Internal movement is a reason for not certifying a hammer. If there is a plug then seal it if it looks like it has been recently opened, otherwise mark it as described in the shot section. Make sure the head is reasonably spherical and made of iron or other metal not softer than brass. (See discussion for the shot and the diameter below.) Check to see that the swivel is free to move.

2. Remove any existing tape from the hammer, particularly from the wire loops. These locations will be retaped anyway, and this will ensure that any illegally taped weights are eliminated.

3. Check both the minimum and maximum length of the hammer. The 7.260 kg, 6 kg and 12 lb implements must be at least 117.5 cm and not more than 121.5 cm from the inside of the grip to the end of the head. IAAF has modified the 5 kg length to 116.5 cm to 120.0 cm. For 4 kg, 3 kg and 2 kg implements, the measurements are 116 cm and 119.5 cm, respectively. When measuring length, make sure the wire is straight but not stretched nor curled. The weight of the hammer itself is usually not enough to straighten the wire, particularly if the wire has been curled from normal use or for transport. Applying additional tension may be necessary. Be careful not to apply too much tension so as to stretch the wire, the wire loops, or handle. With a hammer stretcher, be careful to make sure the handle and ball are properly placed so neither will come loose as the tension is increased. Tighten until the wire is reasonably taut but not enough to bend the handle. When taut, use the gauge to check the maximum and minimum lengths. Be careful in doing this measurement. If you are using the TRACKMASTER(TM) or Gill hammer stand, we recommend you use a "C" clamp to hold it firmly to the table surface.

4. Check the weight. This is most easily done by placing the handle on the scale and then putting the head in the handle so it doesn't roll. Make sure the wire does not contact anything in the process. The open men's hammer weight is 7.260 kg (nominally 16 lb) and the women's is 4 kg. If you are using the TRACKMASTER(TM) the weights are 1, 4, and 8 for Men's and 7 for Women's hammer. See Appendix or rule books for other weights.

5. Check the hammer head diameter and roundness. The hammer should be essentially spherical. It must pass in at least three different planes. If it doesn't pass, impound it. It must be at least 110 mm and not more than 130 mm in diameter. For the 4 kg hammer the diameter

measurements are 95 and 110 mm. Note for other weight hammers check the shot dimensions because they are the same.

Note: 1: *There is currently no quantitative check for out of roundness or sphericity, a flat spot etc. What is round may differ from one implement inspector to the next. The spherical nature of the hammer is less important than for the shot because the hammer is not grasped by the head. Likewise, do an eccentricity test as in item 2 for the shot.*

6. Check the center of gravity by placing the hammer head sideways on a 12 mm diameter horizontal sharp edge orifice; that is, the swivel should be oriented horizontally, which isolates the measurement to the most critical axis for the hammer. It passes if it doesn't fall off.

7. Check the wire diameter in at least three places. If it is close or there appears to be a significant amount of wire draw then impound the implement unless the athlete can change the wire and resubmit the implement. The wire should be a single unbroken length of spring wire at least 3 mm in diameter. The most likely places for breaks are where the wire is wound around itself to form the loops at both ends. Likewise any sharp kinks are potential problem areas. The wire is connected to the head by a swivel while the grip is connected to the wire via a loop but not a swivel.

8. Check the size of the loops at both ends of the wire. Neither can be bigger than 1.95 cm in diameter for USATF sanctioned meets. If the loop is too wide, *carefully* squeeze the loop with *padded* pliers until it meets the 1.95 cm maximum. This dimension is not specified by other rulebooks.

NOTE: Why check the loop? Some competitors will come with a big loop and during warm ups it will straighten out making the hammer too long. This has been a parameter in the USATF rulebook for a number of years, but it is not covered in the others. Also check that the wire loop is tight so it won't unraveled when throwing. If appropriate, add adhesive tape or plastic electrical tape over the ends to keep it from unraveling or so the wire ends don't get caught in the cage netting. This is a safety concern rather than an implement weight concern.

9. Check the dimensions of the handle. The handle can be any width. The maximum perpendicular length between the bottom of the grip to lowest edge of loop for connecting the wire is 110 mm. There is no specification of the sides any longer. The handle may be straight or curved. USATF and IAAF require that under a 3.8 kN tension load the handle will not deform more than 3 mm and a minimum breaking strength of at least 8 kN. These force parameters cannot be tested by any of the implement inspection kits. Unless the handle looks very old or significantly bent, pass it, provide it meets the 110 mm length requirement and looks like it can withstand repeated throws without breaking. Also, if there is any movement or looseness where the brace enters the grip, disqualify it.

10. If the implement passes then mark it by painting or taping both the loops at the connection points and the handle so that neither the handle nor the wire can be changed. Mark the swivel plug so that it can't be unscrewed to lengthen the hammer. Alternatively wrap the loops and connection points with colored tape. This is especially useful on days when the landing area is wet. Tape adheres better to both loops and handle than paint which tends to come off through use. If there is a lot of tape or it looks like a weight has been added in the tape, remove it. It takes a lot of tape to add any appreciable weight to a hammer. See Table 1 and Figures 14 to

17 in the Appendix.

WEIGHT:

1. For safety check the weight head and handle for dents or cracks that might cause them to break during competition. Be sure the plug for adjusting the weight is tight. If there is a plug nut, then seal or mark it per shot instructions. Make sure the head is essentially spherical and made of iron or other metal not softer than brass. Check the embedded forged steel eye used for attachment. In some indoor competitions a weight bag or synthetically covered weight may be used. Typically a synthetically cover sphere (which can have internal movement) is contained in a canvas bag or nylon straps which is attached to a handle (See NCAA Rule 10-9 for a picture). Note outdoor or metal weights cannot have internal movement.

2. Check the weight. This is most easily done by placing the handle on the scale and putting the head in the handle so it doesn't roll. The weights for this event are measured in kilograms (kg). If you are using the older TRACKMASTER(TM), you can use weights 6, 7, 8 and 9 for the 35 lb weight. The number 9 weight is optional. The men's weight is 35 lb (15.880 kg) and the women's is 20 lb (9.080 kg). Do not allow wet implement bags.

For indoor weights with canvas bags or nylon straps, some athletes will tape quarters or large washers onto the head to help them make weight. As the head rotates within the bag during successive throws, the quarters will rip free and detach. The implement inspector should be aware of this type of hobby-shop repair. A more proper repair is adding washers to the connecting harness upper clevis pin.

3. Check the maximum length of the weight. It must be no more than 406.4 mm from the inside of the longest leg of the grip to the end of the head (Note: For USATF Masters and WMA competitions the overall maximum length can be 410.0 mm). This is true for both the metal weight and the weight bag. Make sure the links are straight and not curled. Be careful in doing this measurement. If you are using the TRACKMASTER(TM) hammer stand, we recommend you use at least a "C" clamp to hold it to the table surface so it doesn't tip. We also recommend a slight alteration to remove the center extension and add a calibration to the upper leg for ease of measurement. Indoor weights that fail the maximum length measurement due to stretched nylon straps are a common problem. These are corrected by disassembling the center link and twisting one or more straps, effectively shortening them. Also be aware of synthetic indoor weights that are not round. These have been deliberately flattened to ensure they meet the length specification. This is not allowed; the weight itself must be round, and the straps must be shortened to meet the overall length specification. Always remember to check the tightness of the center (or yoke) pin, with your fingers, regardless if you worked to tighten the straps to make length or not.

4. Check the triangular shape of the handle. It should be not more than 190 mm along each side inside the handle, nor less than 100 mm. If the handle does not meet this requirement, impound the implement unless the athlete can change the handle and resubmit the implement. The handle should not stretch appreciably under the weight of the implement. The NCAA now specifies that a hammer handle cannot be used, and if the grip can swivel at its connection point to the ball or bag, it shall be an equilateral triangle with no side more than 190 mm (7.5 in) or less than 100 mm (4 in). If the grip cannot turn, it only needs to be a triangle with the same maximum and minimum dimension requirement.

5. Check that the minimum diameter of the welded steel links making up the connector (USATF rules). Note there is currently some wording difference between the NCAA and the USATF rule book but there is no intent that the rules be different. The NCAA also allows the grip to be connected to the ball by means of a steel line.

6. The 35 lb implement has a minimum diameter of 145 mm and a maximum diameter of 165 mm. The 20 lb implement has a 130 mm minimum and a 150 mm maximum. If they are synthetically covered spherical implements, they can be no greater than 15 mm larger in diameter than the corresponding metal implement. Weight bags have no diameter requirement. See Tables in appendix for other implements.

7. Beginning in 1999, there is now a center of gravity measurement for the metal weight for USATF. If a filling is used, it must be inserted in such a manner that it is immovable and the center of gravity shall be not more than 6 mm from the center of the sphere. This can be checked when the head is not in a bag, do it in a manner similar to the hammer, using a 12 mm diameter sharp-edge orifice. For balls in a bag, the manufacture will specify that it meets the requirement since no measurement can be easily done. (Rule change 2009 in Rule 195.4.)

8. If the implement passes, then mark it by painting or taping both the loops at the connection points and the handle so that neither the handle nor the connectors can be changed. See Table 2 and Figures 18 to 21 in the Appendix.

ULTRAWEIGHT:

The ultraweight pentathlon was formally accepted in the USATF rules book as a Masters event in 2011. It uses implements weighing between 20 lb and 300 lb, depending on the age and gender of the thrower.

For this competition, the 20 lb, 25 lb, 35 lb, 20 kg and 56 lb weights are the same implements as are used in the weight and superweight throws. In addition to the normal inspection, both Meet Management and the Implement Inspector must ensure the correct implements are available per Tables 3 and 9 of the Appendix.

The 98 lb, 200 lb and 300 lb implements are unique to the ultraweight pentathlon – only a limited number of these are available in the United States. The top priority should be the weighing of these implements. Since Associations are not expected to own certified scales in this weight range, Meet management and/or the Implement Inspector must arrange for the weighing to take place in advance of the meet at an establishment with an appropriate scale. The dimensional specifications of these ultraweights are per Table 3 of the Appendix.

JAVELIN:

NOTE: The javelin has the most required measurements so it is very important that the inspection be done in the order listed to limit the measurements on an implement that won't pass. The most common reasons for failure are listed first.

1. Hold the javelin vertically, first tip down then rotate so the tip is up and shake. Listen for any internal movement. Tap the javelin on the floor to make sure there aren't any moveable

parts. Internal movement might impact the center of gravity and therefore its flight characteristics. Loose or rusted internal parts may also be an indication of imminent failure of the javelin – usually snapping in half during the throw or landing.

2. Check the javelin whipcord (grip) to see if it is damp which might help it make weight. If the grip is damp, impound the javelin.

3. Check for indentations, rings, roughness, flutes or other aerodynamic improvements, i.e. non-smooth finish. Normal wear is acceptable as long as the groves aren't symmetric. Remove any clumps of dirt, as this may affect the balance.

Check the javelin for tape or decals. Manufacturer stickers are ok, but other tape is not, which may affect balance or aerodynamic characteristics.

4. Make sure that there isn't any paint or solder on the tip that might come off during the competition thus altering the balance point. Use nail polish remover if you need to remove the paint.

5. Check the overall length, the length of the head and the length of the grip. Make a folding device to measure the overall length and the incremental distances as shown in the equipment section. Alternately mark a retractable steel tape or adhesive tape on the edge of a table with the necessary dimensions. This allows you to quickly lay the javelin on the tape and check the overall length, the length of the point, and length of the grip. Mark the 150 mm tip and tail marks used later for contour measurements (125 mm for 400 g javelins). See Table 6 in the Appendix for all the appropriate dimensions for each of the currently legal javelins.

6. Check the center of gravity by performing the balance test. Most javelins balance at about the second cord on the handle. That is not a specification, just a fact. The javelin should just balance or just drop down at the point. This is the most common reason for why a javelin fails. Mark the center of gravity on the grip (this is where a silver Sharpie pen is very useful if the cord is black). Measure the distance to the tip. See Table 6 for dimensions in Appendix.

7. Check the weight. With the old TRACKMASTER(TM) use the number 1 weight for the men's javelin and no weight for the women's javelin. There is no weight for the 400 g javelin. A 200 g weight can be added to the pan using the balance (200 g + 400 g Javelin = 600 g to verify the weight). For other javelins use other weights.

8. Check the tip for the forty-degree taper maximum taper using the tip guide. This can also be done with a plastic protractor and several pieces of tape. The tip may be rounded due to wear, but the taper of the head into the tip must be 40° or less.

The remaining checks should be made whenever possibly but generally don’t change with use, i.e. they are characteristic of the javelin manufacturing process. Thus if these have been previously checked as signified by the mark of the day or one you recognize then with limited time skip them. The first time a javelin is inspected each year you check these items. Then use a special mark to indicate that these have inspected. These points can then be overlooked for the rest of the season.

9. Check the diameter just in front of the grip or handle. The diameter behind the handle should be no smaller than the diameter in front of the handle less 0.25 mm. Note it is not uncommon for the diameter to be slightly larger behind the grip. The most accurate way to do this is with the calipers. When using the calipers don't push too hard. Just snug it up and move it around to determine the maximum and then the minimum dimension at that point. Record those measurement. The cross section is suppose to be circular but there is a 2% allowance between the largest and smallest diameters at a cross section. The mean of these two measurements will be used for checking the specifications. That means the if the mean diameter is 29 mm then the measured diameter at a cross section could vary as much as from 28.71 to 29.29 mm. Check the diameter of the tail, which must be greater than 3.5 mm for all javelins. Check the diameter of the grip. The difference between the diameter of the grip and the diameter of the shaft at the point at the front of the grip should be no more than 8 mm. There can be no abrupt alterations along the shaft. Note: the older TRACKMASTER(TM) ring sets cannot measure the new javelins properly. See bottom picture in Figure 37 in Appendix under javelin gauges. In the interest of time, some of these measurements may be excluded if a visual check does not show a gross or obvious problem. Some people have started to use semi circular or square gauges to measure diameter as well as the maximum and minimum contour points. See Figures 29 and 30 in Appendix.

10. Mark the 150 mm point from the tip and the tail (substitute 125 mm for the 400 g javelin in all cases). Mark the mid-points between the tip and the center of gravity, and the tail and the center of gravity (a center-point tape measure greatly speeds up this process). Make the necessary measurements using either the TRACKMASTER(TM) gauge or a caliper. The percent of the total diameter for both the Men's and Women's javelin are the same. The diameter at the 150 mm point from the tip must be less than or equal to 80% of the maximum diameter. The diameter at the 150 mm point from the tail must be greater than 40% of the maximum diameter. The diameter at the mid-point between the tip and the center of gravity must be less than or equal to 90 percent of the total diameter. The equivalent point half way to the tail must be greater than or equal to 90% of the maximum diameter. Thus the measurements on the tip end are maximums so measuring device should go beyond the indicated marks and the tail measurements are minimums so the measuring device should not go beyond the marks.

11. Either use a 50 cm long straight edge to check for uniform tapering or use a calipers to measure each point and calculate the percentage at each point if there seems to be a question about the tapering. Any concavity can not exceed 0.20 mm.

12. If the javelin passes all the tests, mark it on tip end near the whip cord or just above the metal head. Do not mark it behind the grip because it may impact an athlete's grip.

Because of the many changes in specifications in javelins over the last 20 years the following table of older javelin specifications is included. You may continue to see some of these implements at meets for the next few years. This table will help you verify what they are. All the dimensions shown are in millimeters. Note: Although there have been several changes to the Masters' 400 g javelin over the last ten years to make it more aerodynamic and easier to manufacture there has not been the formal demarcation date for the specs changes which occurred with the open 800 and 600 g javelins.

HISTORICAL JAVELIN SPECIFICATIONS

Measurement/Group		High School Pre 2002	IAAF Pre 1992	IAAF Pre 1999	High School Pre 2002	IAAF Pre 1986
Users		Girls	Open	Open	Boys	Open
Weight, g		600	600	600	800	800
Length of Javelin	Min.	2200	2200	2200	2600	2600
	Max.	2300	2300	2300	2700	2700
Length of Head	Min.	250	250	250	250	250
	Max.	350*	330	330	350*	330
Length of Rubber Tip	Min.	35			35	
	Max.	77			77	
Diam. of Front of Rubber Tip	Min.	14			14	
	Max.	35			35	
Thickness at Front of Rubber Tip	Min.	5			5	
Length of Grip	Min.	140	140	140	150	150
	Max.	150	150	150	160	160
Length from Tip to	Min.	800	800	800	900	900
	Max.	950	950	950	1100	1100
Diameter of Shaft (D)	Min.	20	20	20	25	25
	Max.	25	25	25	30	30
Diam. Reduction Front to Back of Grip	Max.	-	0.25	0.25		0.25
Diam. Reduction behind Head	Max.	-	2.5	2.5	-	2.5
Diam. at mid point CG to Tip	Max.	-	0.9D	0.9D	-	0.9D
Diam. at mid point CG to Tail	Min.	-	0.7D	0.9D	-	0.9D
Diam. 150 mm from Tip	Max.	-	0.8D	0.8D	-	0.8D
Diam. 150 mm from Tail	Min.	-	0.3D	0.4D	-	0.8D
Diam. 125 mm from Tip	Max.					
Diam. 125 mm from Tail	Min.					
Diam. of Tail	Min.	-	3.5	3.5	-	3.5
Diam. of Grip	Max.		D+8 mm	D+8 mm		D+8 mm
Circumference of Grip over Diam.	Max.	D+1 in			D+1 in	
Diam. at mid point fm front of grip to Tip	Max.					
Diam. at mid point fm front of grip to Tail	Max.					
Angle of Tip	Max.		40º	40º		40º

*When a rubber tip is used, the metal point shall be 70 mm shorter than the normal point, and shall end (before affixing the rubber tie) in a slightly rounded button shape 18-21 mm in diameter for the boy's 800 g and 16-18 mm in diameter for the girl's 600 g. The length and center of gravity with the rubber tip in place may be less than the standard javelin with a metal point but will still fall within the nominal specifications. See Table 6 and Figures 22 to 30 in Appendix.

Mini Javelin:

In 2000 the Youth Committee adopted the 300 gram mini javelin for use with the younger age groups. In 2010 the 500 gram mini javelin was redefined, and the 600 gram mini javelin was introduced.

Each dimension should be checked. Because of the fins, finding the center of gravity requires a much higher balance point. Most dimensions are easily measured with a 15 or 30 cm (6-12 inch) straight edge and the diameters with a caliper. The only other specifications are weight and center of gravity. Alternately you can mark your javelin board with the required dimensions and get a larger fulcrum to determine the center of gravity. Checking the center of gravity is particularly important since some mini javelins have been found to be significantly out of specification in recent years. See Table 7 and Figure 32 in Appendix.

USE OF THE TRACKMASTER(TM) or OTHER CERTIFICATION KITS:

The following section is included as an introduction the TRACKMASTER(TM), UCS, or Gill Implement Certification equipment. (See Figures 33 to 38 in Appendix.) It is the most commonly used weights and measure system in the United States. However, the TRACKMASTER(TM) does not perform all the indicated tests listed in the measurement section. You may have to construct or buy some additional devices to do the measurements. Most are reasonably straight forward. If you have access to either a wood or metal shop you can make your own. Use a caliper and make sure it is accurate, to at least 0.1%.

Generally the TRACKMASTER(TM), UCS, and Gill kit are set up on the principle of pass or fail. It doesn't give you the actual measurement but indicates that you are above the minimum or below the maximum. The TRACKMASTER(TM) is the most widely used system with over 350 units throughout the United States before Daktronics began manufacturing the newer version in 1997. Before that, there were four models sold by Red Meade (original Inventor) of Southern California until the mid 80's and then Jack Benko out of Texas who was the inventor of the Accutrack(TM) timing system until the late 90's. Mark I for Men, Mark II for Women, Mark III for Men, Women and Junior, and Mark IV for High School. Now there are just three: High School with and without Javelin, and NCAA, IAAF & WMA. Gill began sales in 2000. UCS started in 2007. Instructions come with each system but the following is a more detailed description of the tests and how they should be performed and interpreted.

Some of the most common complaints about this equipment are:

1. Initial cost is high ($1250 to $3700 depending on implements to be measured)
2. Cost of maintenance is high
3. Old models have not all been updated with improvements
4. Instructions are not current with rule changes
5. Owners neglect leads to inaccurate measurements
    a. Equipment gets wet and isn't properly dried, and cleaned.
    b. Instructions get lost.
    c. Equipment gets lost.
    d. Equipment gets damaged.
    e. Scale not accurate, or impossible to calibrate.
    f. Every scale responds differently with different accuracy.
    g. Scale cannot be calibrated for the "heavy end" of weights.

USE OF OTHER METHODS:

If you know of other methods that should be discussed please pass them along to Bob Springer, 10063 Arrowsmith Ave. S., Seattle, WA 98178 or via e-mail at bobspringer2@comcast.net.

IMPORTANT IMPLEMENT SPECIFICATION DIFFERENCES BETWEEN THE VARIOUS RULEBOOKS AND DIVISIONS:

Tables 1 -4 in the appendix summarizes all of specifications for all implements. Some data is still needed for the handicap implements. This table was compiled as convenient way to have all the data in one place. In case of a question always refer to the rulebook itself in the event that a table has an incorrect entry.

Weight: There are still some slight difference between the NCAA and USATF concerning the Weight specifications. There is also a length difference between NCAA/USATF Open and USATF Masters/WMA. The WMA rules are different as regards the connection links.

Javelin: There are no longer any differences between the rulebooks for the javelin specifications. All refer to the IAAF specifications.

Hammer: There are no longer any specification differences for the NCAA, USATF, IAAF, and WMA for the hammer. However, only USATF has specs for the size of the wire loop at each end.

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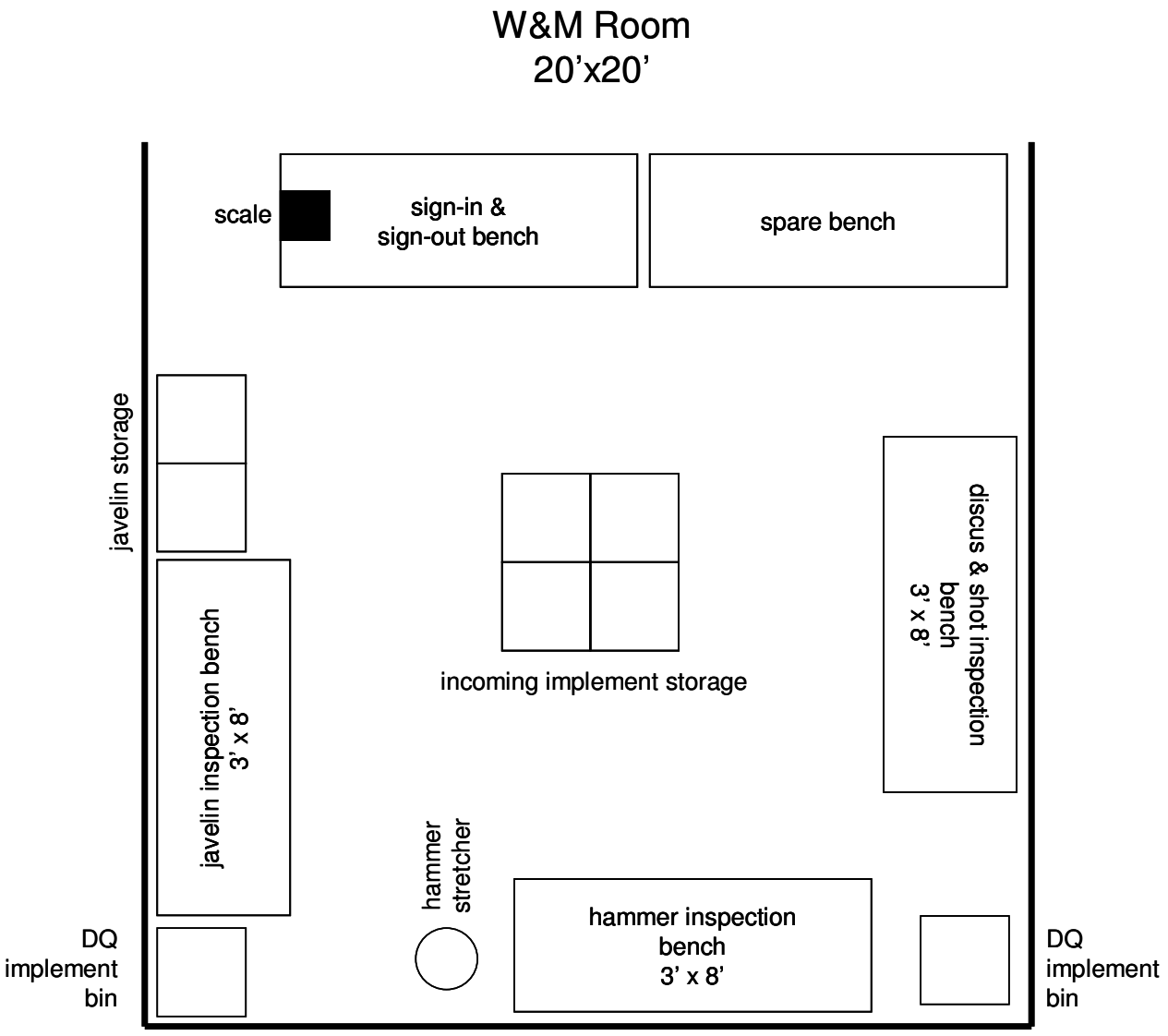

Figure 1: W&M Room Layout - Minimum

Notes:

1. This is a recommendation for adapting an existing space for W&M purposes.
2. Recommended dimensions are 20' x 20'. Spaces as small as 10' x 10' are possible, but are cramped.
3. Ceiling height is 12 ft minimum to accommodate javelin handling.
4. Javelin bench is 44" high; all others are 36" high.
5. Certified implements are stored under the benches or in a separate room.
6. The check-in table should be set up to block general access to the room. Otherwise, the check-in table can be in a separate room.

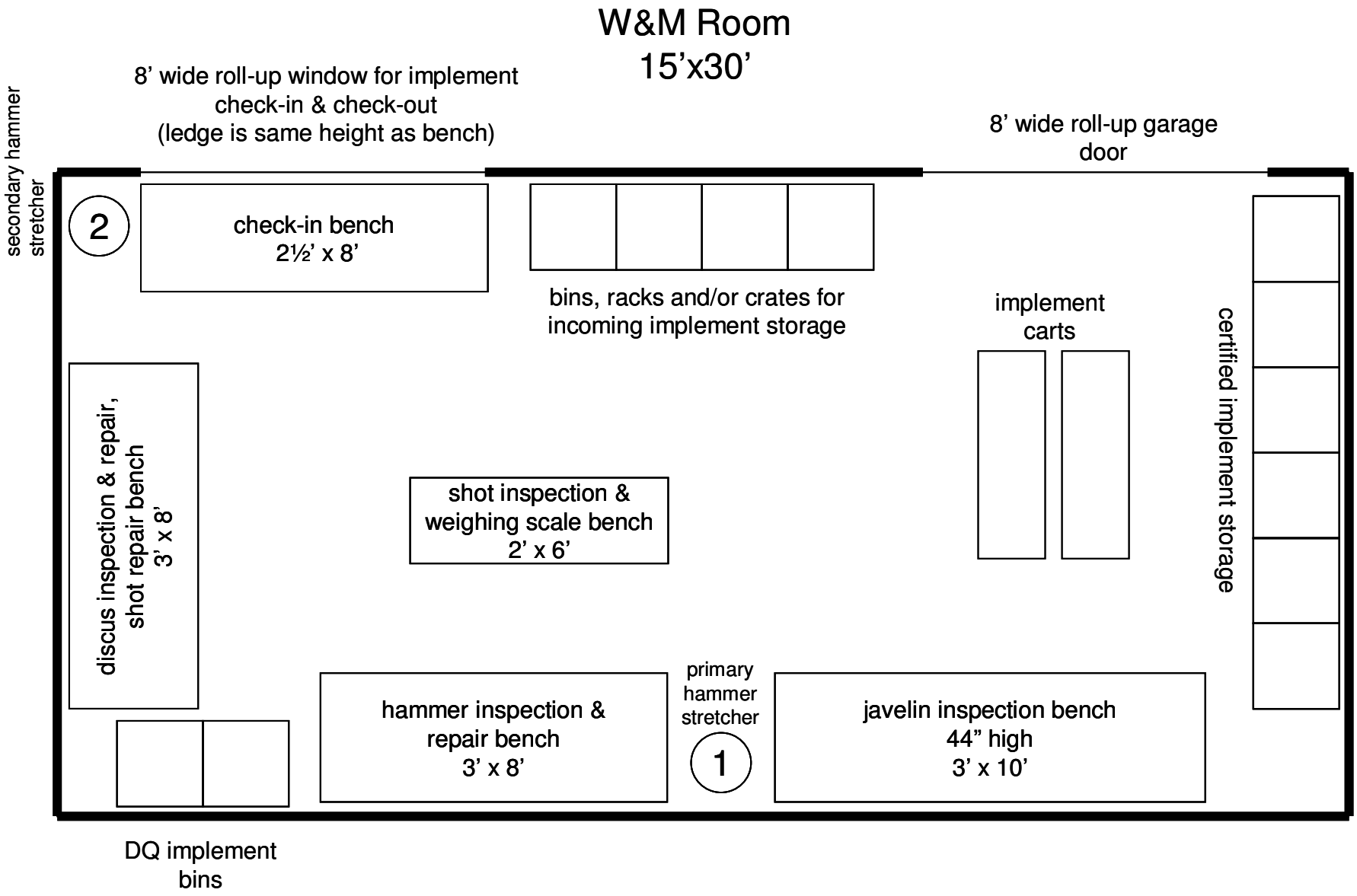

Figure 2: W&M Room Layout - Recommended

See notes on next page.

Notes:

1. This is a recommendation for the design of a new W&M room.
2. Room is 15’ x 30’ inside dimensions
3. Ceiling height is 12 ft minimum to accommodate javelin handling
4. Garage door height must accommodate vertical 800 g javelins which are stored on a cart (~10 ft)
5. Roll-up door & window must be lockable
6. Javelin bench is 44” high; all others are 36” high
7. Weighing table must hold 200 lb without deflecting; others must be sturdy (not flimsy fold-up plastic tables)
8. Benches have space underneath for equipment storage
9. The check-in bench is deliberately narrower than the others
10. Two AC power receptacles required at each wall bench; one receptacle OK at weighing bench – route power under floor rather than a ceiling drop
11. Lighting is required above each work bench
12. Secondary hammer stretcher is for informal length checks at the request of the athlete
13. The basic concept is:

    a. Incoming implements go to the center table for weighing
    b. Then they immediately go to their respective benches for further inspection and repair, if necessary
    c. The exception to (b) is the shot – it can be checked with ring gauges on the scale; it only goes to the discus table if it requires weight addition or surface filing
    d. The javelin bench location is deliberate – this minimizes the distance traveled by a javelin from receipt to storage.

Figure 2: W&M Room Layout - Recommended (con’t)

Figure 3: Beijing Implement Storage

Figure 4: Layout at Des Moines NCAA Division I

IMPLEMENT CHECK-IN STATUS SHEET

IMPLEMENT TYPE _____

MEET: _____

EVENT: _____ AGE GROUP: _____ BY INSPECTOR

SEX: _____ QUALIFYING DATE:___/____/____ DAY: _____ FINALS DATE:___/____/____ DAY: _____

NO. OF IMPLEMENTS INSPECTED:_____ IMPOUNDED:_____ PRELIM. MARK/COLOR OF DAY: _____

COLUMNS TO BE FILLED OUT BY ATHLETE OR COACH FINAL MARK/COLOR OF DAY: _____

	COMPETITOR	AFFILIATION SCHOOL/CLUB/BIB NO.	IMPLEMENT MANUFACTURER	SIZE DIAM./DISTANCE	COLOR/ DESCRIPTION	ALTERNATE NUMBER	IF IMPOUNDED REASON	FLT	FINAL	CLAIM SIGNATURE
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
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17										
18										
19										
20										
21										
22										
23										
24										
25										

TABLE 1
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
HAMMER

HAMMER								
USATF RULE: 200	UNITS							
IMPLEMENT NAME:		**7.26 kg**	**6 kg**	**12 lb**	**5 kg**	**4 kg**	**3 kg**	**2 kg**
AGE GROUP:								
OPEN:		MEN				WOMEN		
MASTERS:		M30-M45	M50-M55		M60-M65	M70-M75	M80+	
						W30-W45	W50-W70	W75+
JUNIORS:			MEN			WOMEN		
HIGH SCHOOL:				BOYS		GIRLS		
WEIGHT:	NOM.-lb	16.00	13.23	12.00	11.02	8.82	6.61	4.41
	NOM. lb-oz	16-0	13-3.6	12-0	11-0.3	8-13	6-9.8	4-6.5
	NOM. kg	7.26	6.00	5.44	5.00	4.00	3.00	2.00
	MIN. for record, kg	7.260	6.000	5.443	5.000	4.000	3.000	2.000
RANGE FOR SUPPLY:	MIN kg	7.265	6.005	5.450	5.005	4.005	3.005	2.005
	MAX kg	7.285	6.025	5.475	5.025	4.025	3.025	2.025
DIAMETER:	MIN mm	110	105	98.4	100	95	85	80
	MAX mm	130	125	117.5	120	110	100	90
OVERALL LENGTH:	MIN mm	1175	1175	1175	1165	1160	1160	1160
	MAX mm	1215	1215	1215	1200	1195	1195	1195
WIRE DIAMETER:	MIN mm	3.0	3.0	3.0	3.0	3.0	3.0	3.0
CENTER OF GRAVITY (off-center)	MAX mm	6	6	6	6	6	6	6
INTERNAL MOVEMENT:		NONE	NONE	NONE	NONE	NONE	NONE	NONE
HANDLE DIMENSIONS*	MAX mm	110L	110L	110L	110L	110L	110L	110L
LOOP DIAMETER: (USATF only)	MAX mm	19.5	19.5	19.5	19.5	19.5	19.5	19.5

NOTE: 2 kg hammer spec and W75+ group effective 5-1-10

* Bottom of grip to bottom of loop

TABLE 2
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
WEIGHT & SUPERWEIGHT

WEIGHT and SUPERWEIGHT									
USATF RULE: 201	UNITS								
IMPLEMENT NAME:		**56 lb**	**20 kg**	**35 lb**	**25 lb**	**20 lb**	**16 lb**	**12 lb**	**4 kg**
AGE GROUP:									
OPEN (weight):				MEN		WOMEN			
OPEN (superweight):		MEN		WOMEN					
MASTERS WEIGHT:				M30-M45	M50-M55	M60-M65	M70-M75	M80+	
						W30-W45	W50-W55	W60-W70	W75+
SUPERWEIGHT		M30-M55	M60-M65	M70-M75	M80+				
				W30-W45	W50-W55	W60-W70	W75+		
WEIGHT:	NOM. lb	56.00	44.09	35.00	25.00	20.00	16.00	12.00	8.82
	NOM. kg	25.40	20.00	15.88	11.34	9.08	7.26	5.45	4.00
	MIN. record kg	25.400	20.000	15.880	11.340	9.080	7.260	5.450	4.000
RANGE FOR SUPPLY:	MIN. kg	25.405	20.005	15.885	11.345	9.085	7.265	5.455	4.005
	MAX. kg	25.425	20.025	15.905	11.365	9.105	7.285	5.475	4.025
Overall length (NCAA, Open):	MAX mm	406.4		406.4		406.4			
WMA/MASTERS	MAX mm			410.0	410.0	410.0	410.0	410.0	410.0
HANDLE (triangular):	MAX mm	190	190	190	190	190	190	190	190
	MIN mm	100	100	100	100	100	100	100	100
CENTER OF GRAVITY:	MAX mm			6	6	6	6	6	6
DIAMETER:	MIN mm	-	-	145	130	120	110	100	95
	MAX mm	-	-	165	150	140	130	120	110
INDOOR DIAMETER WMA	**MAX mm**	**-**	**-**	**180**	**165**	**155**	**145**	**135**	**125**

NOTE: 4 kg weight spec and W75+ group effective 5-1-10

* inside dimensions

For NCAA meets accept the 20 and 35 lbs weights if they meet the imperial weight even if slightly below the metric equivalent.

Footnotes: Internal movement allowed in NCAA Indoor implements. No internal movement (i.e. solid sphere) for USATF and WMA implement.

TABLE 3
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
ULTRAWEIGHT PENTATHLON

Age Group	Weight, lb	Super-Weight, lb	35 lb	20 kg	56 lb	98 lb	200 lb	300 lb
	MEN							
Open-49	35	56				x	x	x
50-59	25	56				x	x	x
60-69	20	44			x	x	x	
70-79	16	35		x	x	x		
80+	12	25	x	x	x			
	WOMEN							
Age Group	Weight, lb	Super-Weight, lb	20 lb	25 lb	35 lb	20 kg	56 lb	98 lb
Open-49	20	35				x	x	x
50-59	16	25			x	x	x	
60-74	12	20		x	x	x		
75+	4 kg	16	x	x	x			

Ref.: USATF Rule 196.

Main body: The main body is a cylinder, whose diameter shall not be less than 15.25 cm, nor more than 26.70 cm.

Handle: The handle shall be in a triangular or modified triangular shape, with no side exceeding 20 cm inside dimension. The handle must be rigid and not show evidence of elasticity or malformation after being thrown.

Connection assembly: The main body shall incorporate a permanent eye bolt, u-bolt or shackle in its construction, which may swivel. The handle should be connected by means of a removable shackle or links. No more than two links shall be used, in addition to the hamdle shackle and main body connection.

Overall length: The overall length of the complete implement, from the inside surface of the handle (grip) to the bottom surface of the main body shall not exceed 45.75 cm.

Weight specifications: The ultraweights shall conform to the following specifications:

Implement	**98 lb**	**200 lb**	**300 lb**
Minimum Weight (kg)	44.50	90.80	136.10

TABLE 4
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
SHOT

SHOT		Nominal size							
	UNITS								
		16 lb	**6 kg**	**12 lb**	**5 kg**	**4 kg**	**3 kg**	**6 lb**	**2 kg**
Age group:									
USATF, NCAA Open:		Men				Women			
USATF Masters Men:		M30-M45	M50-M55		M60-M65	M70-M75	M80+		
USATF Masters Women:						W30-W45	W50-W70		W75+
USATF Youth Boys:				young men		Youth		Midget	
USATF Youth Boys:				Int. boys				Bantam	Sub-Bantam
USATF Youth Girls:						Y. women		Youth	
USATF Youth Girls:						Int. girls		Midget	
USATF Youth Girls:								Bantam	Sub-Bantam
High school:				Boys		Girls			
IAAF Open:		Men				Women			
IAAF Youth Boys:			Junior		Youth				
IAAF Youth Girls:						Jr., Youth			
WMA Men:		M35-M45	M50-M55		M60-M65	M70-M75	M80+		
WMA Women:						W35-W45	W50-W70		W75+
Weight:	Nom. lb	16.00	13.23	12.00	11.02	8.82	6.61	6.00	4.41
	Nom. lb-oz	16-0	13-3.7	12-0	11-0.3	8-13	6-10.6	6-0	6-6.5
	Nom. kg	7.26	6.00	5.44	5.00	4.00	3.00	2.72	2.00
	Min. kg	7.260	6.000	5.443	5.000	4.000	3.000	2.720	2.000
Range for supply:	Min. kg	7.265	6.005	5.450	5.005	4.005	3.005	2.725	2.005
	Max. kg	7.285	6.025	5.475	5.025	4.025	3.025	2.745	2.025
Diameter (all):	Min. mm	110	105	98.4	100	95	85		80
Dia (USATF men, boys)	Max. mm	130	125	117.5	120	110	110		
Dia (USATF masters men)	Max. mm	130	130		130	130	130		
Dia (USATF master women)	Max. mm					110	110		90
Dia (high school)	Max. mm			117.5		110			
Dia (NCAA)	Max mm	130				110			
Dia (IAAF)	Max mm	130	125		120	110			
Dia (WMA men)	Max mm	130	125		120	120	120		
Dia (WMA women)	Max mm					110	110		90
Dia (USATF men indoors)	Max. mm	145	140		135	125	125		
Dia (USATF women indrs)	Max. mm					130	130		110
Dia (USATF masters men indoors)	Max. mm	145	145		145	145	145		
Dia (IAAF, NCAA indoors)	Max. mm	145				130			
Dia (USATF YB indoors)						130			
Circumference HS only:	Min. mm			309.1		298.4			
	Max. mm			369.1		345.6			

Sources:
USATF Rules 188.4, 221.5, 301, 320.2, 332.3.(g)
NCAA Rules 2-8.3, 10-7.3
NFHS (high school) Rule 6.5.2
IAAF Rules 188.5, 221.6
WMA: Appendix A, Rules 2 & 3

NOTE:
Masters W75+ group is effective 5-1-10
Youth Sub-Bantam group is effective 2011

TABLE 5
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
DISCUS

DISCUS							
	UNITS						
		2 kg	**1.75 kg**	**1.6 kg**	**1.5 kg**	**1.0 kg**	**0.75 kg**
Age group:							
USATF, IAAF, NCAA Open:		Men				Women	
USATF Masters Men:		M30-M45			M50-M55	M60+	
USATF Masters Women						W30-W70	W75+
USATF Youth Boys:				young men		Youth	
USATF Youth Boys con't:				Intermediate		Midget	
USATF Youth Girls:						all	
High school:				boys		girls	
IAAF Youth Boys:			Junior		Youth		
IAAF Youth Girls:						all	
WMA Men:		M35-M45			M50-M55	M60+	
WMA Women:						W35-W70	W75+
Weight:	Nom. lb	4.41	3.86	3.53	3.31	2.20	1.65
	Nom. kg	2.00	1.75	1.60	1.50	1.00	0.75
	Min. record	2.000	1.750	1.600	1.500	1.000	0.750
Range for supply:	Min kg	2.005	1.755	1.605	1.505	1.005	0.755
	Max kg	2.025	1.775	1.625	1.525	1.025	0.775
Diameter (overall):	Min mm	219	210	209	200	180	166
	Max mm	221	212	211	202	182	169
Diameter (center plate):	Min mm	50	50	50	50	50	50
	Max mm	57	57	57	57	57	57
Thickness (at center plate):	Min mm	44	41	40	38	37	33
	Max mm	46	43	42	40	39	37
Thickness (rim @ 6 mm in):	Max mm	13	13	13	13	13	13
	Min mm	12	12	12	12	12	10

Sources:
USATF Rules 189.3, 301, 320.2, 332.3.(g)
NCAA Rules 2-9.3
NFHS (high school) Rule 6.4.2
IAAF Rule 189.2
WMA: Appendix A, Rule 4

TABLE 6
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
JAVELIN

JAVELIN								
USATF RULE: 206	UNITS							
IMPLEMENT NAME:		**800 g**	**800 g**	**700 g**	**600 g**	**600 g**	**500 g**	**400 g**
AGE GROUP:		POST 86			POST 98			
OPEN:		MEN NCAA			WOMEN NCAA			
MASTERS:		M30-M45		M50-M55	W30-W45 M60-M65		W50-W55 M70-M75	M80+ W60+
JUNIORS:		MEN			WOMEN			
YOUTH:				IAAF BOYS	YOUTH			
		INTERM			INTERM			
		Y MEN			Y WOMEN			
HIGH SCHOOL:			HS BOYS[c]			HS GIRLS[c]		
WEIGHT:	NOM. G	800	800	700	600	600	500	400
	NOM. OZ	28.22	28.22	24.69	21.16	21.16	17.64	14.11
	MIN. RECORD	800	800	700	600	600	500	400
RANGE FOR SUPPLY:	MIN G	805	805	705	605	605	505	405
	MAX G	825	825	725	625	625	525	425
LOCATION OF MAX. DIAMETER:	GRIP	FRONT	FRONT	FRONT	FRONT	FRONT	FRONT	FRONT
DIAMETER AT THICKEST POINT:	MIN MM	25	25	23	20	20	20	20
	MAX MM	30	30	28	25	25	24	23
DIAM REDUCTION AT REAR OF GRIP	MAX MM	0.25	0.25	0.25	0.25	0.25	0.25	0.25
OVERALL LENGTH:	MIN MM	2600	2600	2300	2200	2200	2000	1850
	MAX MM	2700	2700	2400	2300	2300	**2100**	1950
LENGTH OF HEAD:	MIN MM	250	250	250	250	250	220	200
	MAX MM	330	330	330	330	330	270	250
DIST. FROM TIP TO CENTER GRAVITY:	MIN MM	900	900	860	800	800	780	750
	MAX MM	1060	1060	1000	920	920	880	800
WIDTH OF GRIP:	MIN MM	150	150	150	140	140	135	130
	MAX MM	160	160	160	150	150	145	140
OVER MAX SHAFT DIAM @ GRIP:	MAX MM	8	8	8	8	8	8	8
CIRC. OVER SHAFT @GRIP:	INCH		<1			<1		
DIAMETER VARIATION:	MAX %	<2%	<2%	<2%	<2%	<2%	<2%	<2%
DIAM @ 125 MM FROM TIP:	MAX %							=<80%
DIAM @ 150 MM FROM TIP [a].	MAX %	=<80%	=<80%	=<80%	=<80%	=<80%	=<80%	
DIAM BEHIND HEAD-DIAM OF HEAD	MM MAX	=<2.5	=<2.5	=<2.5	=<2.5	=<2.5	=<2.5	=<2.5
DIAM @ MIDPOINT FROM CG TO TIP [a]:	MAX %	=<90%	=<90%	=<90%	=<90%	=<90%	=<90%	=<90%
DIAM R MIDPOINT FROM CG TO TAIL [a]:	MIN %	=>90%	=>90%	=>90%	=>90%	=>90%	=>90%	=>90%
DIAM REAR AT 125 MM [a] :	MIN %							=>40%
DIAM REAR AT 150 MM [a]:	MIN %	=>40%	=>40%	=>40%	=>40%	=>40%	=>40%	
DIAM AT TAIL [a]:	MIN MM	=>3.5	=>3.5	=>3.5	=>3.5	=>3.5	=>3.5	=>3.5
TIP ANGLE	MAX DEG	=<40	=<40	=<40	=<40	=<40	=<40	=<40

NOTE: CONVERSIONS 2.20462 lb per kg/ 16 oz per lb/ 453.5924 g per lb /28.34953 g per oz

Footnote: a) The Trackmaster™/Gill gauge should pass beyond the mark since it is a “shall not exceed” dimension; i.e., less than or equal to this measurement.

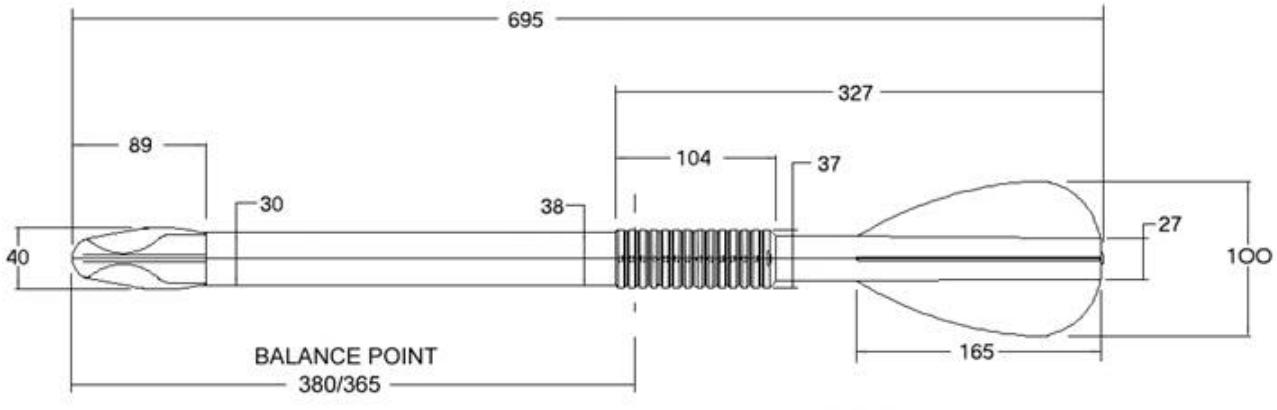
b) The Trackmaster™ /Gill gauge should not pass beyond the mark since it is a “shall exceed” dimension; i.e., greater than or equal to this measurement.

c) If use a rubber tip then there are alternate specifications (see the javelin section or Rule 6-5-2 in High School Rules). This javelin should meet all IAAF specs. Not all are shown in the HS rulebook but they do apply. When using a rubber tip (or soft plastic) the metal point shall end before affixing the rubber tip in a slightly rounded button-shape 18-21 mm in diameter for the boy's javelin and 16-18 mm in diameter for girl's javelin. Overall length of rubber tip 35-77 mm.
Diameter at front of the tip is 14-35 mm and thickness at front of tip is 5 mm minimum.

TABLE 7
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
MINI JAVELIN

In 2000 the Youth Committee adopted the 300 gram mini javelin for use with the younger age groups. In 2010 the 500 gram mini javelin was redefined, and the 600 gram mini javelin was introduced. The shaft, grip and fins will be made out of plastic; the tip shall be made of soft rubber with a blunt, rounded tip. The fins must be smooth, and shall be parallel to the centerline of the shaft.

MINI JAVELIN SPECIFICATIONS		
Weight, minimum, g	300 & 400	500 & 600
Overall Length min., mm	685	1100
Overall Length max., mm	705	1140
Length of Head min., mm	84	85
Length of Head max., mm	94	95
Tip Diameter at largest point, min., mm	37	35
Tip Diameter at largest point, max., mm	43	45
Distance from tip to CG min., mm	365	560
Distance from tip to CG max., mm	380	610
Diameter of Shaft forward of grip min., mm	30	30
Diameter of Shaft forward of grip max., mm	38	38
Diameter of Shaft behind grip min., mm	24	31
Diameter of Shaft behind grip max., mm	30	37
Diameter of Shaft at grip min., mm	34	40
Diameter of Shaft at grip max., mm	40	45
Length of grip min., mm	99	105
Length of grip max., mm	109	125
Location of front of grip from tip of tail min., mm	322	550
Location of front of grip from tip of tail max., mm	332	570
Number of Fins	4	4
Fin Length min., mm	162	165
Fin Length max., mm	168	175
Fin diameter (peak to peak opposing fins) min., mm	95	85
Fin diameter (peak to peak opposing fins) max., mm	105	95



300 & 400 gram Mini Javelin
All dimensions (except balance point) are typical

TABLE 8
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
IAAF AGE GROUP IMPLEMENTS

	Men		
Event/Division	Boys (Youth)	Men (Junior)	Men (Senior)
Shot	5 kg	6 kg	7.260 kg
Discus	1.5 kg	1.75 kg	2 kg
Javelin	700 g	800 g	800 g
Hammer	5 kg	6 kg	7.260 kg

	Women		
Event/Division	Girls (Youth)	Women (Junior)	Women (Senior)
Shot	4 kg		
Discus	1 kg		
Javelin	600 g		
Hammer	4 kg		

age	16-17	18-19	20-34

Per 2009 IAAF Rule 187.1

TABLE 9
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
USATF MASTERS IMPLEMENTS

	Men													
Event/Age	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99+
Shot	7.260 kg				6 kg		5 kg		4 kg		3 kg			
Discus	2 kg				1.5 kg		1 kg							
Javelin	800 g				700 g		600 g		500 g		400 g			
Hammer	7.260 kg				6 kg		5 kg		4 kg		3 kg			
Weight	35 lb				25 lb		20 lb		16 lb		12 lb			
Superweight	56 lb						20 kg		35 lb		25 lb			
Ultraweight	98 lb, 200 lb, 300 lb						56 lb, 98 lb, 200 lb		20 kg, 56 lb, 98 lb		35 lb, 20 kg, 56 lb			

	Women													
Event/Age	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99+
Shot	4 kg				3 kg					2 kg				
Discus	1 kg									0.750 kg				
Javelin	600 g				500 g		400 g							
Hammer	4 kg				3 kg					2 kg				
Weight	20 lb				16 lb		12 lb			4 kg				
Superweight	35 lb				25 lb		20 lb			16 lb				
Ultraweight	20 kg, 56 lb, 98 lb				35 lb, 20 kg, 56 lb		25 lb, 35 lb, 20 kg			20 lb, 25 lb, 35 lb				

Per 2011 USATF Rules 332.3.g & 203.3

TABLE 10
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
WMA MASTERS IMPLEMENTS

Men

Event/Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99+
Shot	7.260 kg			6 kg		5 kg		4 kg		3 kg			
Discus	2 kg			1.5 kg		1 kg							
Javelin	800 g			700 g		600 g		500 g		400 g			
Hammer	7.260 kg			6 kg		5 kg		4 kg		3 kg			
Weight	35 lb			25 lb		20 lb		16 lb		12 lb			

Women

Event/Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99+
Shot	4 kg			3 kg					2 kg				
Discus	1 kg								0.750 kg				
Javelin	600 g			500 g		400 g							
Hammer	4 kg			3 kg					2 kg				
Weight	20 lb			16 lb		12 lb			4 kg				

Per 2010 WMA rules Appendix A, Section 2

TABLE 11
THROWING IMPLEMENT SPECIFICATIONS SUMMARY
USATF YOUTH IMPLEMENTS

	Boys					
Event/Division	Sub Bantam	Bantam	Midget	Youth	Intermediate	Young Men
Shot	2 kg	6 lb		4 kg	12 lb	
Discus			1 kg		1.6 kg	
Javelin	300 g mini			600 g	800 g	
Hammer					12 lb	

	Girls					
Event/Division	Sub Bantam	Bantam	Midget	Youth	Intermediate	Young Women
Shot	2 kg	6 lb			4 kg	
Discus			1 kg			
Javelin	300 g mini			600 g		
Hammer					4 kg	

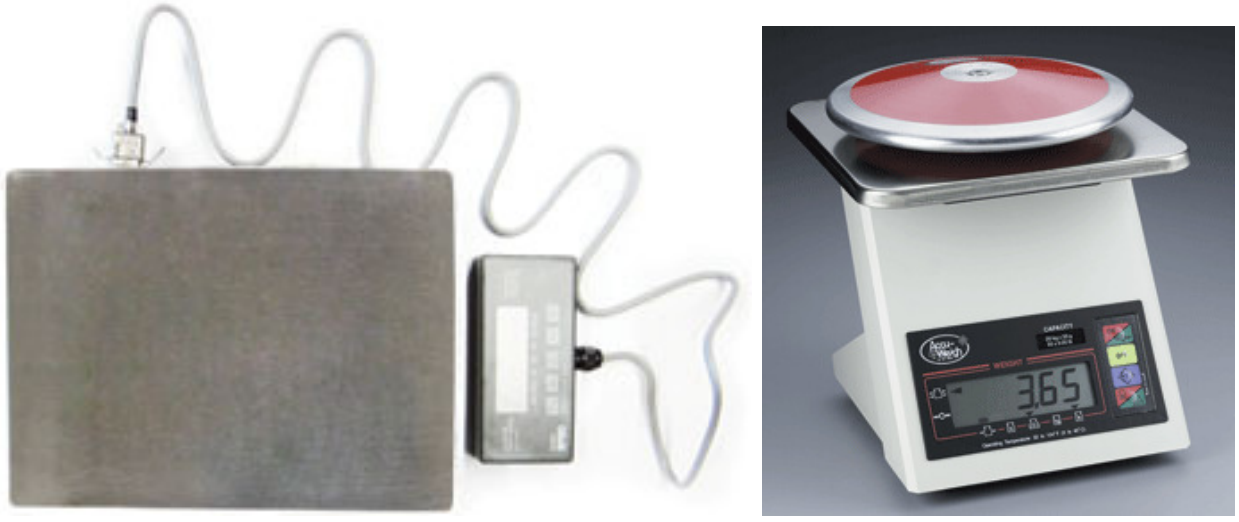
age	8 & below	9-10	11-12	13-14	15-16	17-18

Per USATF Rules 300.1.b & 301

Figure 5: Implement Inspection and Scale at Gateshead, England

Figure 6: Old Trackmaster Level Scale with Weight

Figure 7: Doran Scale used in Pacific and So. California



UCS Kit Scale **MF Athletics Scale**

Figure 8: UCS and MF Athletics Scales

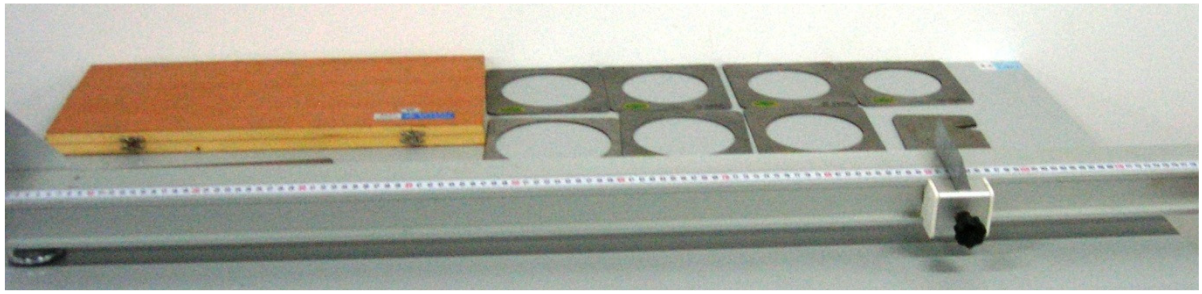


Figure 9: Shot/Hammer Diameters and Javelin at Beijing Olympic Games

Figure 10: Original Trackmaster ™ Discus Measurements

Figure 11: Discus Measurements for Beijing Olympics

Note: Not to scale although dimensions are correct.

Figure 12: Discus Gauge used in England

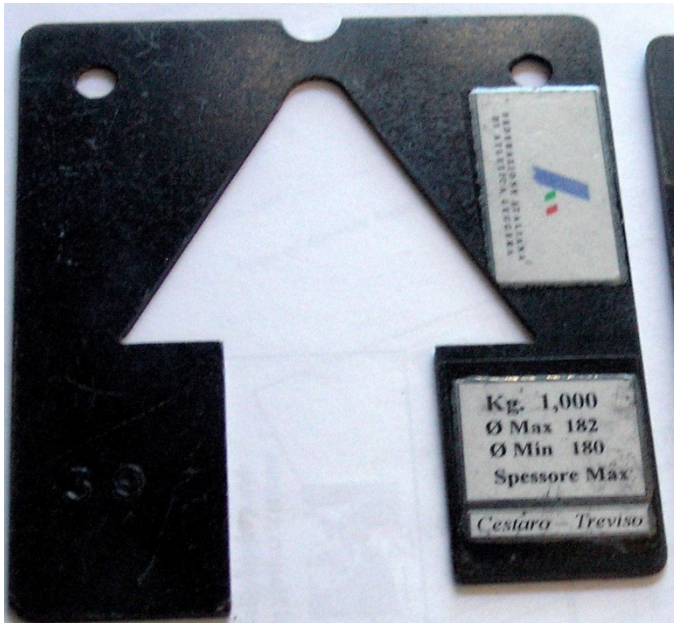


Figure 13: Discus Gauge used in Italy

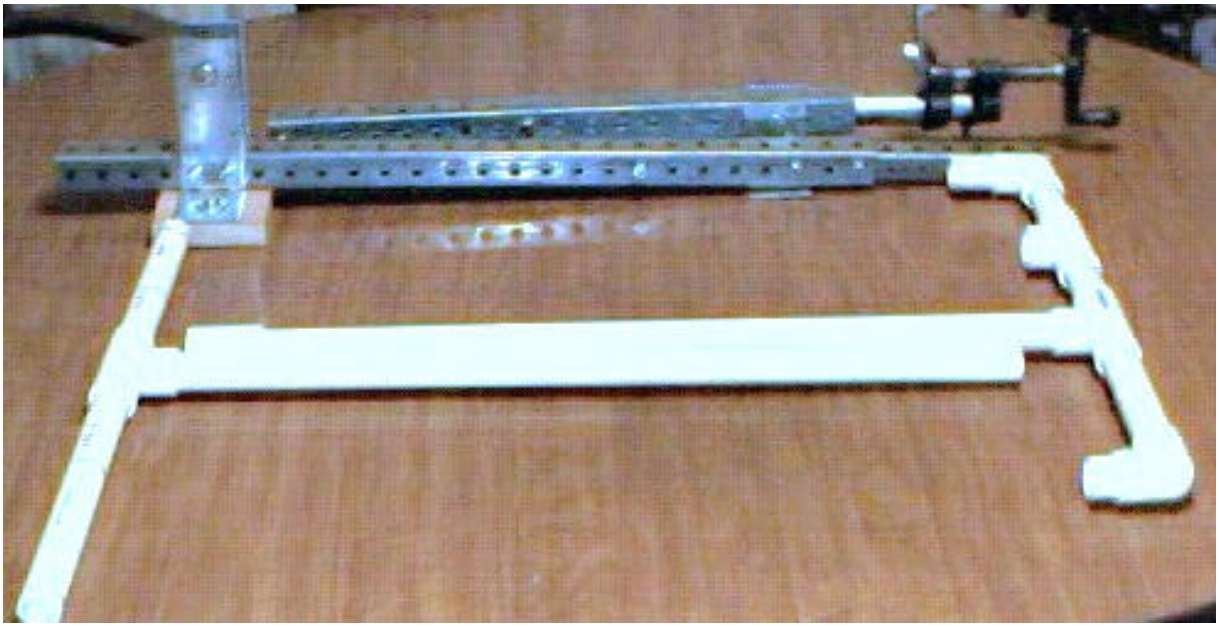
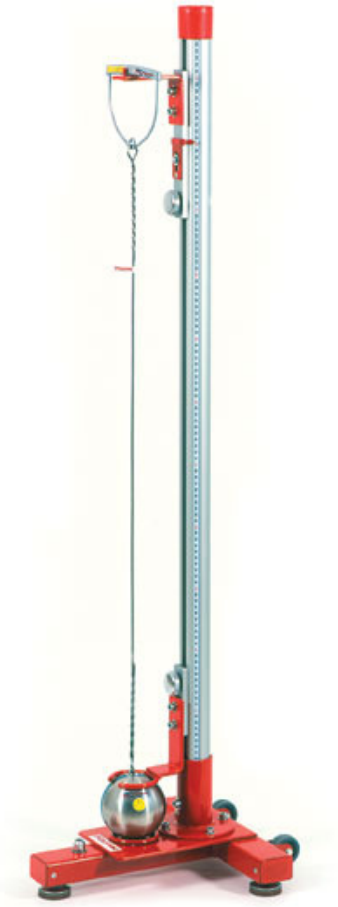


Figure 14: Hammer Stretcher and Length Gauge used in Pacific Association

Fig. 15: Beijing Hammer Stretcher & Scale

Fig. 16: Nordic Hammer Stretcher

Italian Version at WMA Championships 2007



Polanik Version

Figure 17: Hammer Stretchers

Figure 18: Weight Length Measurement

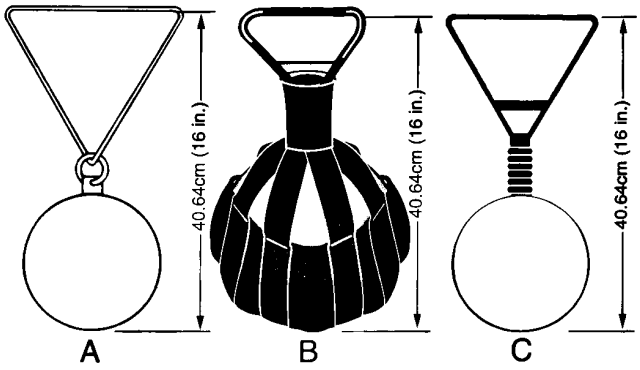


Figure 22—The Weight

Figure 19: Types of Weights (NCAA Rulebook)

Figure 20: Polanik and VS Athletics Weights

Figure 21: Italian Shot, Hammer & Weight Rings

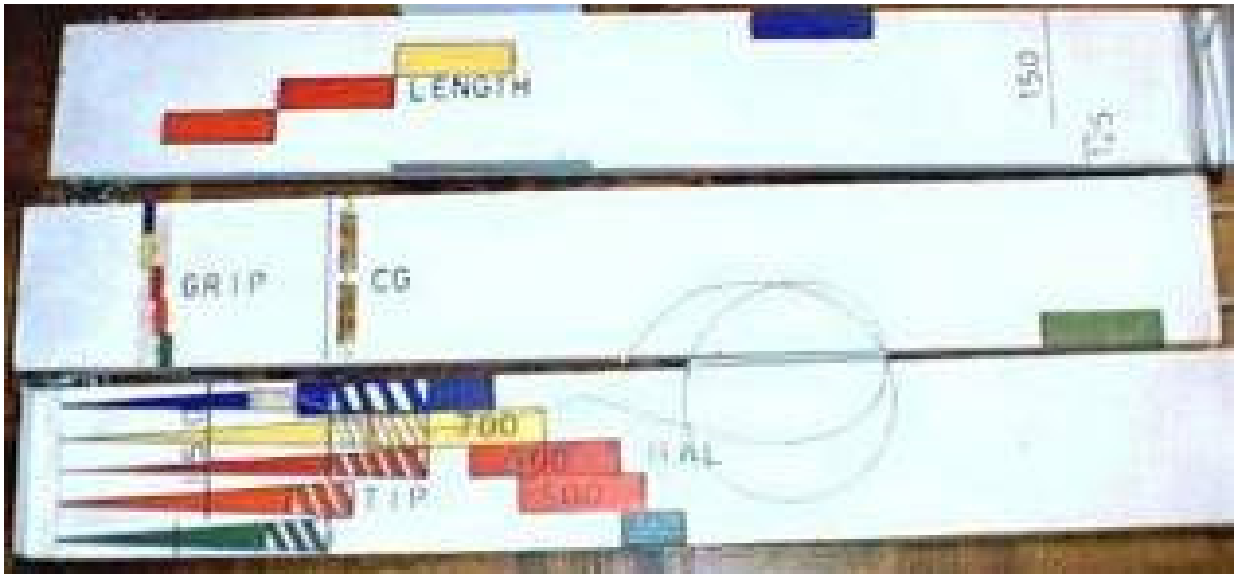


Figure 22: My Javelin Board for All Five Javelin Size in Three Pieces

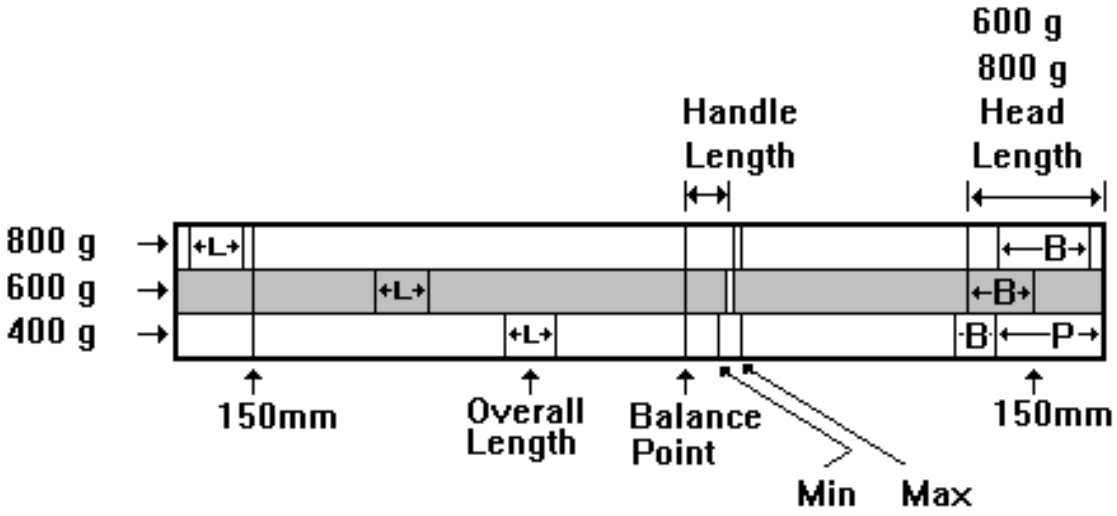


Figure 23: My Original Javelin Board for Three Sizes

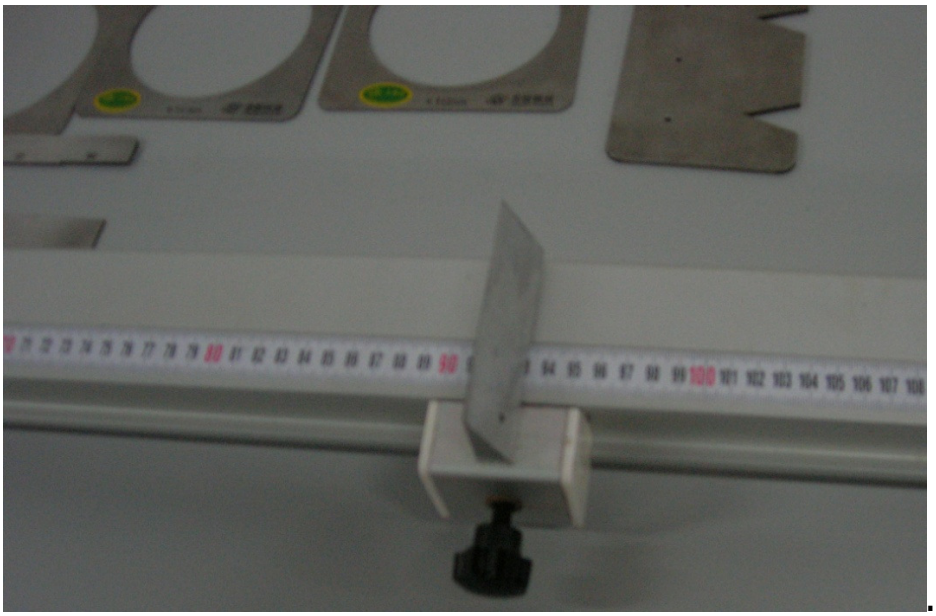


Figure 24: Beijing Javelin Board and Templates

Nordic Balance Detail

Figure 25: Nordic Javelin Balance and Length Measurements in Australia

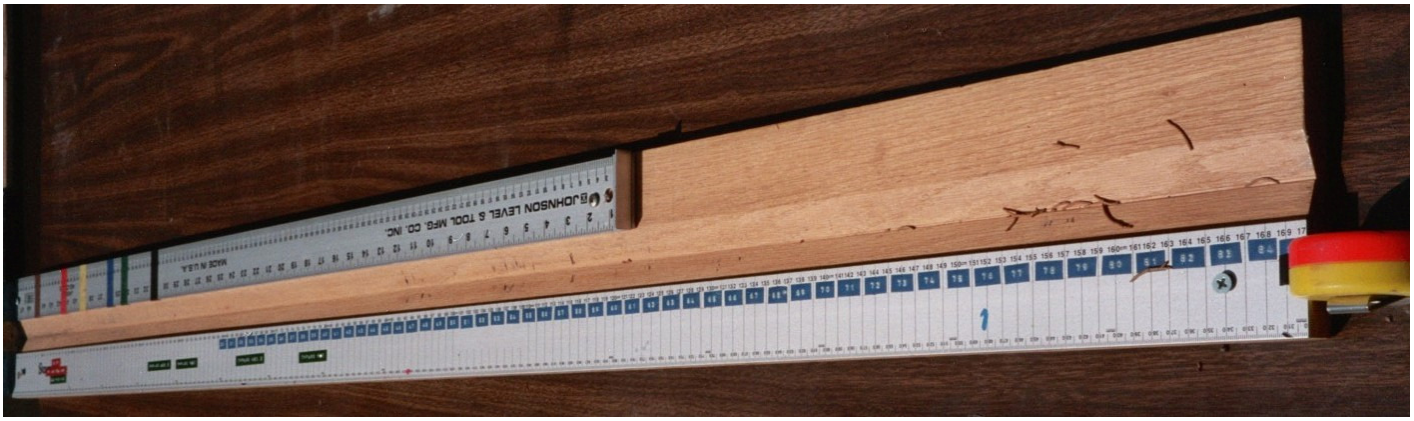


Figure 26: So. California Seaman Javelin Board

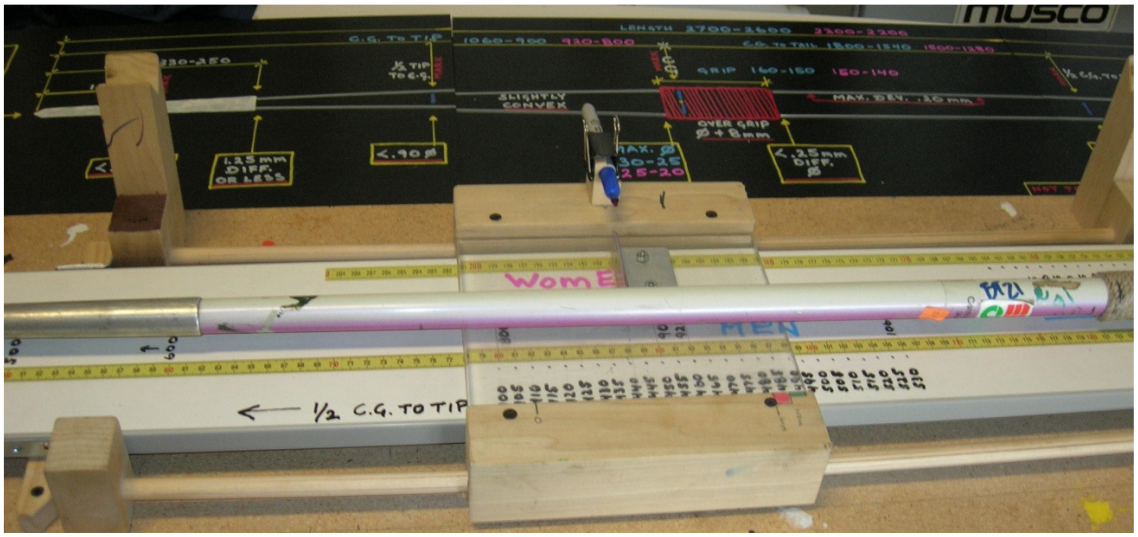


Figure 27: Moveable Javelin Balance and Length Measurement used in Iowa

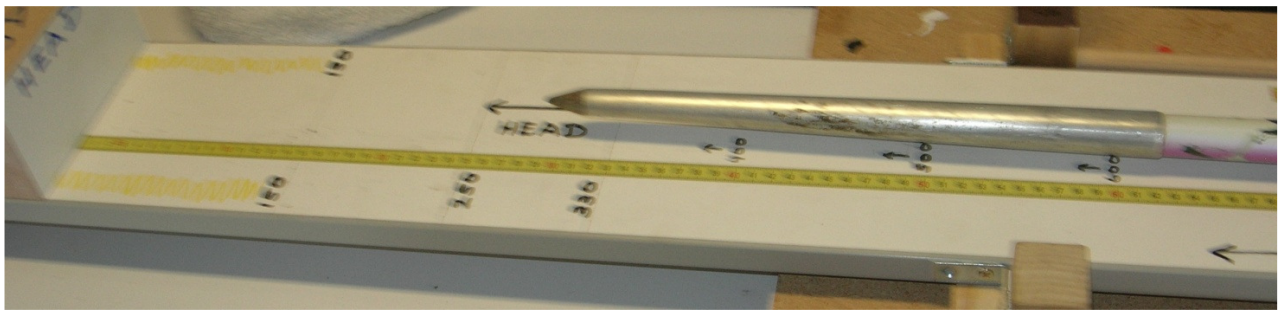


Figure 28: Head Measurement for Javelin (Iowa)

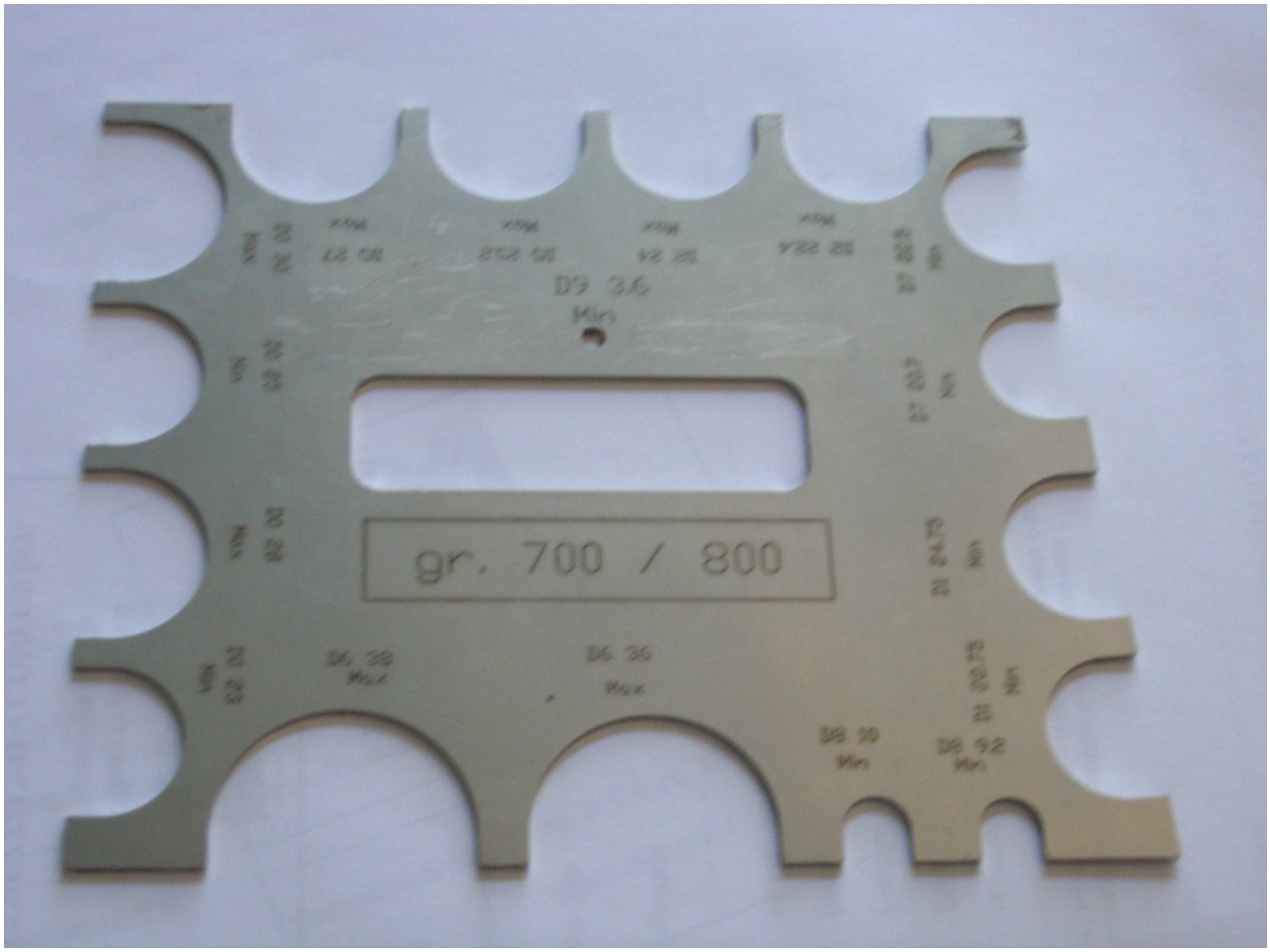


Figure 29: Javelin Diameter Measurement used in Italy

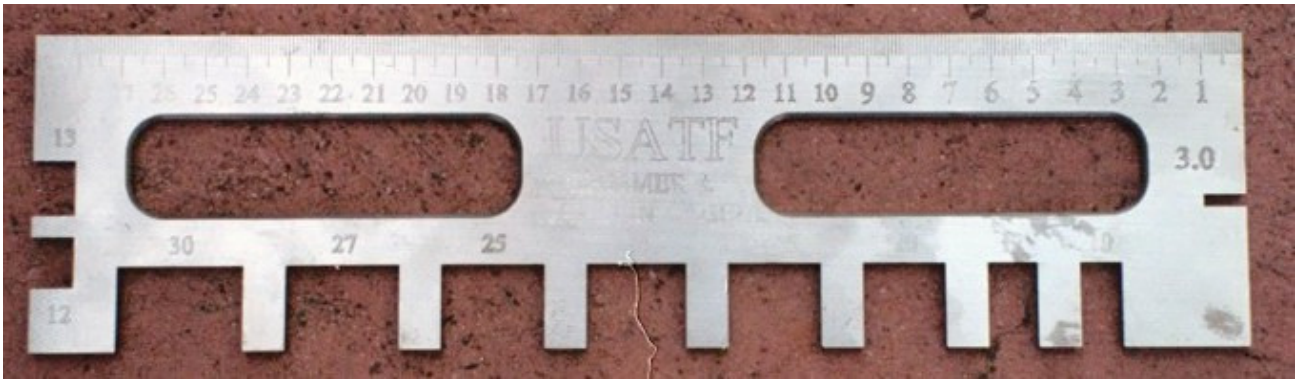


Figure 30: Javelin Contour Gauge used in So. California

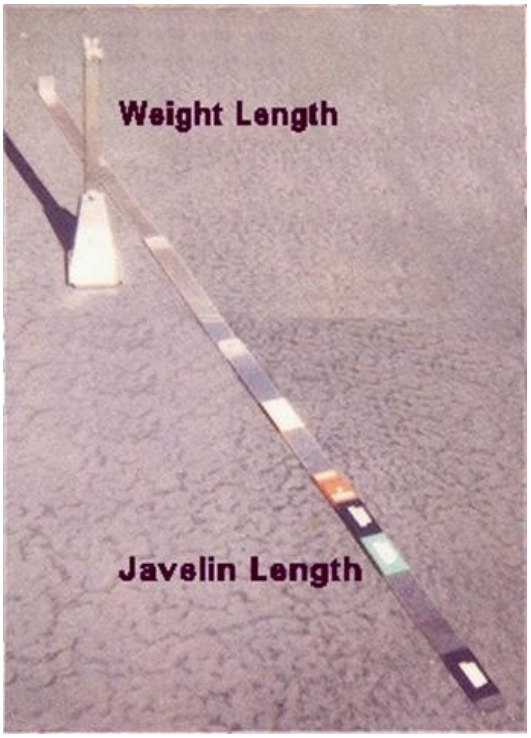


Figure 31: Gill Javelin Overall Length Measuring Device

Figure 32: Mini Javelin

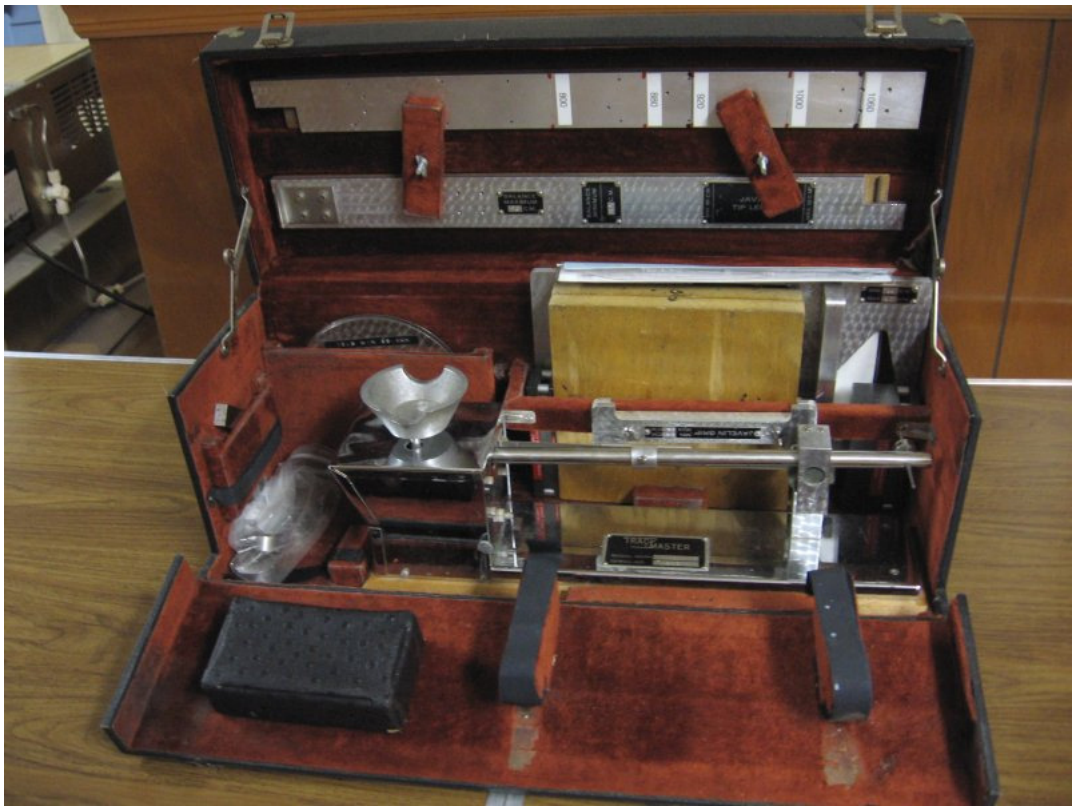


Figure 33: Original Trackmaster Case

Figure 34: Trackmaster Kit Laid out

IAAF/WMA/NCAA/NFHS Implement Certification Kit #93080

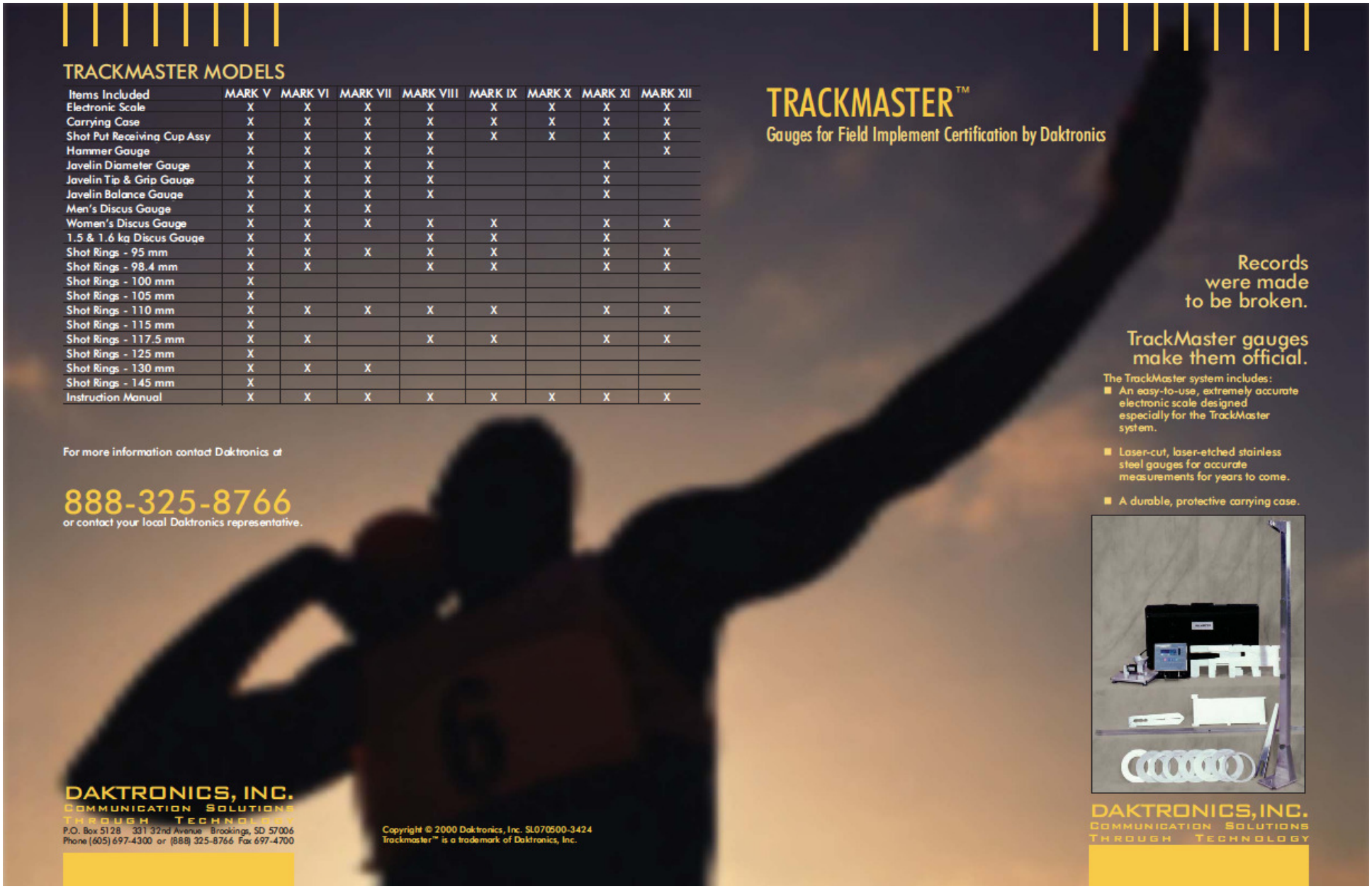
With the Gill Implement Certification Kit, officials can be assured that each implement meets specifications. This self-contained unit, including scale, checks the specifications for the discus, javelin, shot put and hammer. The gauges and labels are laser cut stainless steel for extreme accuracy and permanency.
Kit Includes:

- 85 mm and 120 mm ring gauges
- 1k, 1.5k and 2k discus gauges
- 400 g, 500 g, 600 g, 700 g and 800 g javelin grip and tip gauges
- Javelin balance and diameter gauges
- Hammer length gauge
- 20k electronic scale
- Scale ring
- Aluminum case with foam

Price: $3,590.00

Figure 35: Gill Measuring Kit

Figure 36
Daktronics Trackmaster Kit


TRACKMASTER MODELS
TRACKMASTER™
Gauges for Field Implement Certification by Daktronics
Records were made to be broken.
TrackMaster gauges make them official.
The TrackMaster system includes:
An easy-to-use, extremely accurate electronic scale designed especially for the TrackMaster system.
Laser-cut, laser-etched stainless steel gauges for accurate measurements for years to come.
A durable, protective carrying case.
For more information contact Daktronics at
888-325-8766
or contact your local Daktronics representative.
DAKTRONICS, INC.
COMMUNICATION SOLUTIONS THROUGH TECHNOLOGY
P.O. Box 5128 331 32nd Avenue Brookings, SD 57006
Phone (605) 697-4300 or (888) 325-8766 Fax 697-4700
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Trackmaster™ is a trademark of Daktronics, Inc.
DAKTRONICS, INC.
COMMUNICATION SOLUTIONS THROUGH TECHNOLOGY

Items Included	MARK V	MARK VI	MARK VII	MARK VIII	MARK IX	MARK X	MARK XI	MARK XII
Electronic Scale	X	X	X	X	X	X	X	X
Carrying Case	X	X	X	X	X	X	X	X
Shot Put Receiving Cup Assy	X	X	X	X	X	X	X	X
Hammer Gauge	X	X	X	X				X
Javelin Diameter Gauge	X	X	X	X			X	
Javelin Tip & Grip Gauge	X	X	X	X			X	
Javelin Balance Gauge	X	X	X	X			X	
Men's Discus Gauge	X	X	X					
Women's Discus Gauge	X	X	X	X	X		X	X
1.5 & 1.6 kg Discus Gauge	X	X		X	X		X	
Shot Rings - 95 mm	X	X	X	X	X		X	X
Shot Rings - 98.4 mm	X	X		X	X		X	X
Shot Rings - 100 mm	X							
Shot Rings - 105 mm	X							
Shot Rings - 110 mm	X	X	X	X	X		X	X
Shot Rings - 115 mm	X							
Shot Rings - 117.5 mm	X	X		X	X		X	X
Shot Rings - 125 mm	X							
Shot Rings - 130 mm	X	X	X					
Shot Rings - 145 mm	X							
Instruction Manual	X	X	X	X	X	X	X	X

Figure 37
Daktronics Trackmaster

TRACKMASTER™ Gauges for Field Implement Certification by Daktronics

For years track and field officials, coaches and athletes have depended on Trackmaster gauges to certify that the implements used during events meet specifications. Certified implements ensure that athletes can qualify for state, regional or national competition, and that new records will go in the books.

Daktronics has redesigned the Trackmaster system, adding exciting new features while maintaining the proven go/no go system. All of the implements are easy to use and are designed and manufactured for years of trouble-free use.

All TrackMaster gauges are laser cut stainless steel to provide extremely accurate measurements that will always be correct. All labels on the gauges are laser-etched for accuracy and permanency.

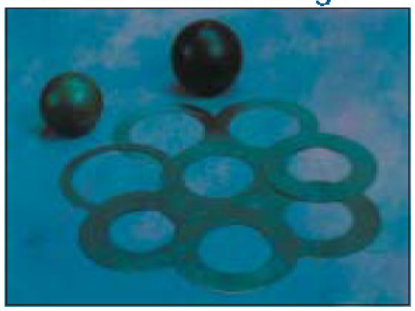
More than 500 TrackMaster systems are currently in use throughout the United States. TrackMaster implements were used at the 1996 Centennial Olympic Games in Atlanta, Georgia.

Digital Electronic Scale

Daktronics, in association with Mettler Toledo, a leading scale manufacturer, has developed a unique digital scale especially for the TrackMaster system.
Now it's easy to read the exact weight of your implement and know exactly how close it is to the specification. Just press a button to reset the scale to zero, place the implement on the receiver cup, and read the weight.

- Easy to use - no tip weights or scale calibration required
- Works for javelin, discus, hammer, shot
- Easy reset to zero prior to weighing
- Easy to read illuminated digits
- Accurate to the nearest 5/1000 of a pound (2 grams)
- Weighs implements up to 40 pounds (20,000 grams)

Shot & Hammer Rings



The standard set of shot rings has been expanded to include gauges for all WAVA shots and hammers. The shot rings are designed to check for the maximum and minimum implement diameters.

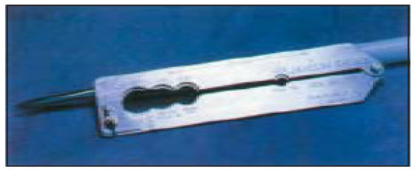
Hammer Gauge

The hammer gauge now incorporates gauge marks for the men's hammer, women's hammer, and 35 pound weight. A wire tension device allows the inspector to apply tension to the hammer wire to completely straighten it before measurement. A hammer balance test pin is mounted on the base of the hammer gauge and calipers are provided to measure the hammer wire size.

Javelin Gauges

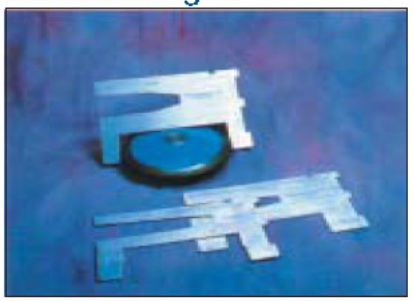
The javelin tip and grip gauge is used to measure the tip length and grip length of the javelin. This gauge includes measurements for all javelins used including those for high school, college, international and WAVA men's and women's competition.

The javelin balance gauge is used to ensure the javelin is properly weighted. All javelins pivot from a single point. The gauge folds neatly inside itself for easy storage.



The javelin diameter gauge is used to verify that the implement is the correct diameter at various points along the length of the javelin as specified by the rules.

Discus Gauges



All dimensional measurements required in testing a discus are now available with one gauge plate. Separate gauge plates are also available for the men's, women's and 1.5/1.6 kg discus. The new gauge designs use the same proven go/no go procedure to check implements.

Other Daktronics Products for Track & Field

- Scoreboards
- Timing Systems
- Start Systems
- Manual Timing
- Meet Management Systems

DAKTRONICS, INC.
COMMUNICATION SOLUTIONS THROUGH TECHNOLOGY

Available Models:

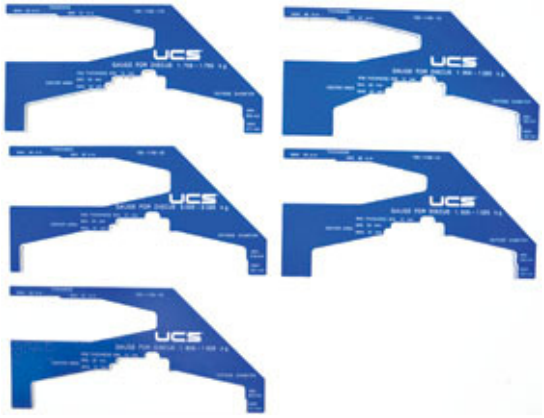
Mark V	for Collegiate, High School and WAVA competition
Mark VI	for Collegiate and High School competition
Mark VII	for Collegiate competition
Mark VIII	for High School competition
Mark IX	for High School competition without Hammer and Javelin measuring devices
Mark X	scale and carrying case

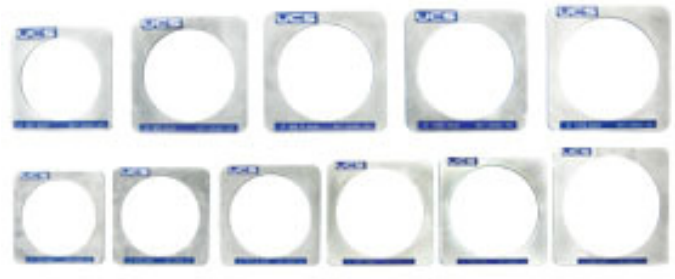
All of the models listed above include gauges for both men's and women's implements. See back page for details.

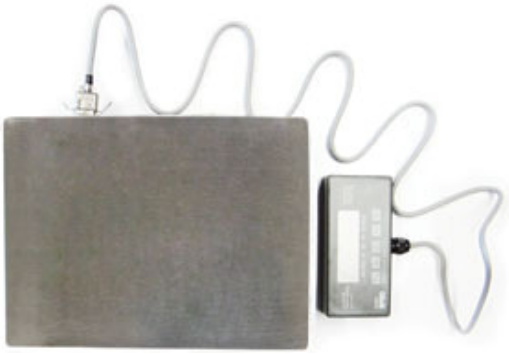
UCS Implement Certification Unit / 726-2600

Designed, engineered and manufactured to look, feel, and measure the way high quality measuring gauges should.

All UCS Implement Certification Unit are machined for the upmost accuracy, as well as, being safe and easy to use. Each unit that is comfortable to handle and aesthetically pleasing, comes complete with discus, javelin, shot put gauges and digital scale to measure implements meeting the standards of the IAAF, NCAA, and the National High School Federation. Hammer certification unit is sold separately. To protect your investment each unit comes complete with a padded rotationally molded, rolling carrying case.







$3,700.00

Figure 38: UCS Measuring Kit

UCS Implement Carts

VS Athletic Carts

Figure 39: Implement Carts

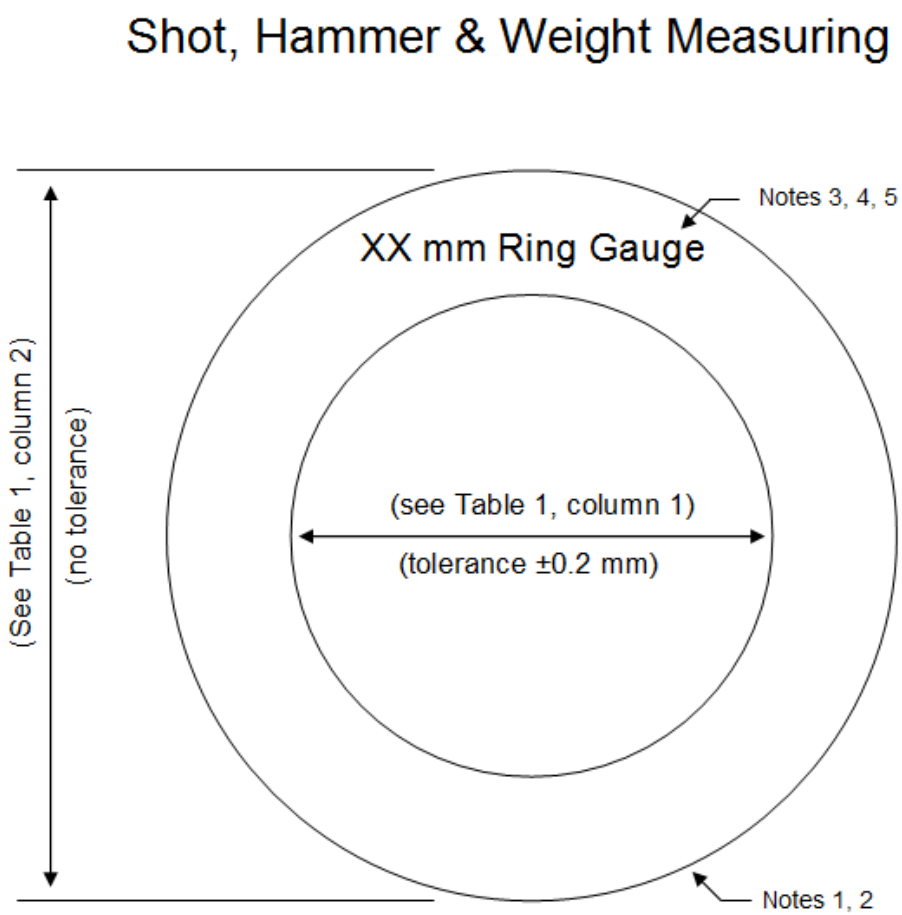
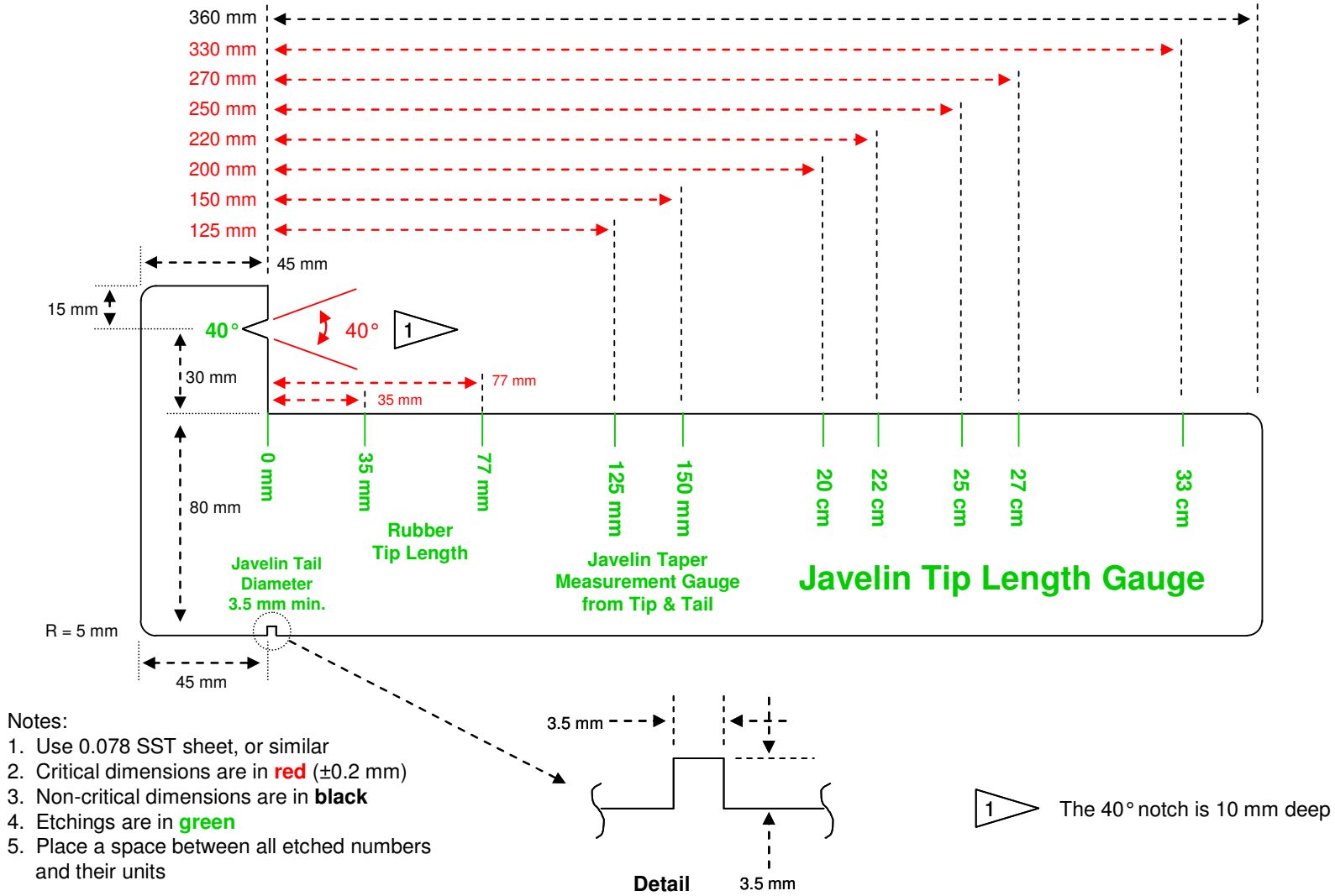

Shot, Hammer & Weight Measuring Rings
Notes 3, 4, 5
XX mm Ring Gauge
(See Table 1, column 2)
(no tolerance)
(see Table 1, column 1)
(tolerance ±0.2 mm)
Notes 1, 2
Notes:
1. Use 0.078 SST sheet, or similar
2. Inner & outer diameters to be approx. concentric, but no req'd tolerance
3. Etched text; no specified font size
4. "XX" value is from Table 1, column 1 entry
5. Put space between "XX" value and "mm" per ISO 31-0

Table 1: ring dimensions

Inner dia, **mm** (column 1)	Outer dia, **inch** (column 2)
80	7
85	7
90	7
95	7
98.4	7
100	7
105	7
110	7
117.5	7
120	7
125	7
130	7
132.5	7
135	9
140	9
145	9
150	9
155	9
165	9
180	9

Figure 40: Ring Gauge Templates

Javelin Tip & Taper Length Gauge



Notes:
1. Use 0.078 SST sheet, or similar
2. Critical dimensions are in **red** (±0.2 mm)
3. Non-critical dimensions are in **black**
4. Etchings are in **green**
5. Place a space between all etched numbers and their units

Figure 41: Javelin Head Template

Osaka

Beijing

Eugene

Figure 42: Retrieval Vehicles

Figure 43: Remote site scale setup in Pacific Northwest

Doubly redundant scales deployed at throwing location: Sartorius CPA34001S scale on left, powered by factory-optional battery pack (hidden behind scale), and an older model Trackmaster scale (RLWS load cell connected to Mettler-Toledo Panther terminal) powered by a deep-cycle battery via a static inverter.

Figure 44: Inland Northwest Ohaus RD30LS

Covers the full range of weighing, including Superweight